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Victor Garlngarr and Barbara Gurwalwal: Caring for Country in the Warddeken Indigenous Protected Area, Arnhem Land

Finding common ground in north-east Victoria

A collaborative pathway to Working on Country—the Northern Rivers journey

Working with Anangu to conserve rare plants in the Anangu Pitjantjatjara Yankunytjatjara Lands of South Australia

Anmatjerre traditional ecological knowledge and conservation of Antjulkinah, the Giant Sweet Potato

Indigenous plant conservation, Guanaba Indigenous Protected Area, Queensland

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SPECIAL THEME: PLANT CONSERVATION ON ABORIGINAL/INDIGENOUS LANDS

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Australasian Plant Conservation

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Front cover: Anmatjerre people, Traditional Owners for an area north of Alice Springs, Northern Territory, with drying tillers of Antjulkinah, the Giant Sweet Potato (*Ipomoea polpha* subsp. *latzii*). Photo: Andrew Rayner.

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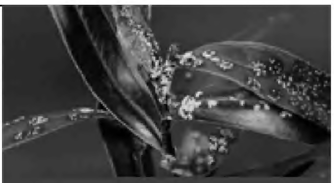
Myrtle Rust training course – coming soon

ANPC, in association with the Royal Botanic Gardens & Domain Trust, Sydney, and the National Meat Industry Training & Advisory Council Ltd (MINTRAC), is developing a one-day training course on Myrtle Rust, a new and major threat to Australia's native flora.

The course will run through April-June 2011 at ten venues in eastern NSW; fees, dates and venues are not yet finalised as this issue of APC goes to press. The course is being designed to meet Unit of Competency RTE3407A: 'Identify and report unusual disease or plant pest signs', and we hope to run it with accredited certification. It will also cover the background of Myrtle Rust, basics of impact- and risk-assessment, monitoring recommendations, and a basic introduction to field biosanitation options.



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(subject 'EoI Myrtle Rust'),
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From the Editor

Rosemary Purdie

c/- Centre for Plant Biodiversity Research, Canberra.

This issue of *Australasian Plant Conservation* focuses on the theme 'Plant conservation on Aboriginal/ Indigenous lands'. Many Indigenous communities have a direct role in land management (including plant conservation) through their responsibilities for land they hold under native title, various Land Rights regimes, and/or land included in the Indigenous Protected Area network. For other communities however, involvement in the management of their traditional country may be more indirect.

The Indigenous Protected Area (IPA) system makes a significant contribution to the conservation of Australia's plant diversity. An IPA is defined as an area of Indigenous-owned or managed land (or sea) where Traditional Owners have entered into an agreement with the Australian Government to promote biodiversity and cultural resource conservation[1]. The communities are supported by the Australian Government to manage the IPAs for conservation to protect the plants, animals and cultural sites for the benefit of all Australians. Forty two Indigenous Protected Areas have been declared across Australia, covering almost 24 million hectares and comprising almost 25 per cent of Australia's National Reserve System; their locations are shown on the map at <www.environment.gov.au/indigenous/ipa/map.html>.

Appropriate management of Indigenous Protected Areas is supported through the Australian Government's *Caring for our Country* program, the objectives of which include:

- to support Indigenous land owners to develop, declare and manage Indigenous Protected Areas on their lands as part of Australia's National Reserve System;
- to support Indigenous interests to develop cooperative management arrangements with Government agencies managing protected areas; and
- to support the integration of Indigenous ecological and cultural knowledge with contemporary protected area management practices.

Each declared IPA is actively managed by its Indigenous owners, administered through an Indigenous organisation or land council. Their management relies on both traditional and western scientific knowledge, and day to day management includes weed and feral animal control, fire management, revegetation, protection of threatened species and monitoring.

Articles in this issue of *Australasian Plant Conservation* highlight a range of activities carried out in various parts of Australia on various types of land, including Indigenous Protected Areas in the Northern Territory, Queensland and New South Wales, to protect plant species. They also highlight the use of traditional Indigenous skills and knowledge and non-Indigenous scientific understanding and techniques to help achieve plant conservation.

Many of the articles give a sense of how plant conservation relates to and is part of traditional 'Caring for Country', and cannot be divorced from language and culture. This is highlighted in the first article (pages 3-5) in a 'conversation' between Traditional Owners from the Warddeken Indigenous Protected Area in Arnhem Land, Northern Territory, and non-Indigenous scientists.

The next two papers (pages 5-9) provide examples—from north-east Victoria and the Northern Rivers Region of New South Wales—of processes used to develop Indigenous/non-Indigenous partnerships aimed at land management supporting plant conservation. These and other papers in the issue highlight the fact that 'no one size fits all'; partnerships need to be negotiated and developed according to the aspirations and needs of local Indigenous communities as well as non-Indigenous perceptions of plant conservation requirements. A common thread in such partnerships however is developing processes that facilitate knowledge sharing and building community capacity.

Subsequent papers (pages 10-23) give examples of plant conservation work being carried out in South Australia, the Northern Territory, Queensland and New South Wales. They include conserving particular types of plants, for example species used traditionally for food or medicine, as well as protecting species or ecological communities listed as threatened under national and state environment laws, and managing threats to, or restoring, particular vegetation types.

Most of the papers included in the issue highlight the importance of Indigenous knowledge in plant conservation. This is examined in more detail in the final article (pages 24-25) that describes a recent workshop specifically looking at how Indigenous knowledge about the cultural value of plants could be better supported

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[1] Sources of information on Indigenous Protected Areas: www.environment.gov.au/indigenous/ipa/index.html; www.environment.gov.au/indigenous/ipa/background.html; www.environment.gov.au/indigenous/ipa/envronmental.html

The outcome is a proposed Indigenous-driven ethnobotany centre to be progressed in partnership with local western scientific institutions. Although focusing on tropical areas of Australia, it may well provide a model for other parts of the country.

Completing the issue is an article (pages 26-28) summarising some of the key plant conservation outcomes from the 10th Conference of the Parties (COP10) to the Convention on Biological Diversity held in October 2010 in Japan, and an update on ANPC in the USA (pages 28-29). The issue concludes with regular items: research roundup, two book reviews, useful information resources, and conferences and workshops.

This is my last issue as Editor of *Australasian Plant Conservation*; Selga Harrington will be taking over from issue 20(1). My thanks to past and present ANPC staff and Committee members who have helped ensure each issue appears on time. My thanks also to all those who have contributed articles over the last three years; keep them flowing in, and enjoy reading this issue.

Victor Garlngarr and Barbara Gurwalwal: Caring for Country in the Warddeken Indigenous Protected Area, Arnhem Land

Victor Garlngarr[1], Barbara Gurwalwal[1], Sam Bentley-Toon[2], Emilie Ens[2] and Gill Towler[3]

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Introduction

Victor *Balang* Garlngarr and Barbara *Wamudjan* Gurwalwal were born in western Arnhem Land and have lived there for most of their lives. They grew up predominantly in outstations around the Aboriginal towns of Kunbarllanjnja (Oenpelli) and Maningrida. In 2002 Victor and others were invited by the late Wamud Namok AO to help establish the Manwurrk Rangers and Warddeken Land Management Limited, based at Kabulwarnamyo outstation on the Arnhem Plateau. Victor has worked for Warddeken since then and has been a key player in the development and implementation of the Western Arnhem Land Fire Abatement project (Russell-Smith *et al*. 2009) which makes up a large part of Warddeken's land management activities. He has worked extensively, alongside linguists, as a translator and interpreter helping to forge successful communication between *balanda* (non-Aboriginal people) and *bininj* (Aboriginal people from western Arnhem Land). In addition to these roles, Victor is an important cultural leader and 'ceremony man' in the region.

Barbara, Victor's wife, was officially employed as a Manwurrk Ranger in 2009, the same year as the Warddeken Indigenous Protected Area (IPA) was declared and added to the National Reserve System. Barbara is also heavily involved in ceremonies and is a skilled fibre artist. The couple have recently moved to an outstation called Kumarrirnbang in the north of the Warddeken IPA.

Victor Garlngarr and Barbara Gurwalwal near a buffalo damaged area at Kabulwarnamyo, Arnhem Land. Photo: Emilie Ens.

Emilie Ens has worked with Victor and Barbara at Kabulwarnamyo since 2008, carrying out participatory ecological research projects and developing land management approaches that draw on both Indigenous and non-Indigenous knowledge systems. Gill Towler joined the project in 2009 and Sam Bentley-Toon became a research assistant in 2010.

Talking about plant conservation

In January 2011 Victor and Barbara made a trip to Canberra, where Emilie, Gill and Sam held discussions with them about their country and its management. The discussions were held in English, however Victor and Barbara conferred frequently in Kunwinjku, their first language, and Victor would often speak for them both.

Victor and Barbara have strong cultural and familial connections to their land and consider it important to live on country (as opposed to in a town). Victor spoke of the relationship between the land, the people and the ancestor spirits that still inhabit it: "... when we go back to our country we feel really happy, like that country happy, all the old people [ancestors and elders] are happy." Victor described the spiritual world of Dreamings, ancestors and 'the law' as constant and immutable while the physical landscape, plants and animals are subject to change and can be destroyed. When talking about bush tucker plant harvesting, Victor said that people rarely take too much; they aim to leave some for next season.

Dreamings are an important part of Aboriginal belief systems and play a crucial role in a person's interaction with the natural environment. Victor and Barbara explained that Dreamings (or *Djang*) are in part creation beliefs about plants, animals, landscape features and natural phenomena, such as lightning, that are often linked to particular places. *Bininj* have many Dreamings which are connected to one's maternal and paternal lineages. Children become Traditional Owners of their father's country and *djungayi* (akin to the Western role of manager) of their mother's country. *Bininj* may also feel responsibility for their grandparents' country or country they've been adopted into through connections other than family.

Customarily, *bininj* have regulated relationships with their Dreaming animals or plants and people are responsible for 'looking after' their Dreaming places and the ancestors that inhabit them. Victor highlights that much of the motivation for his ranger work comes from his sense of obligation to the Dreamings on his country. He has plans to start up a satellite ranger station in Kumarrirnbang in order to expand Warddeken's land management effort into where he has matrilateral obligations and responsibilities.

Fire on the Arnhem Plateau. Photo: Warddeken Land Management Limited.

Fire management

Fire management is of utmost importance to Victor, primarily as a function of cultural tradition and natural resource use with inherent motivation for conservation, protection and sustainability of these traditions and resources. He spoke of cultural obligation to maintain the customary fire management practice of early dry season burning: "fire is very important in cultural way. It's been around a long time". Aboriginal people customarily used (and sometimes still do use) fire to hunt—directly to kill animals or to drive them to a particular area, and indirectly to promote green pick and create a low understory to facilitate detection and pursuit of animals (Altman 2009). Additionally, fire was kept out of rainforest and wetland areas to protect the many useful plants that grow in these highly biodiverse 'supermarkets', such as the yams *mankindjek* (*Dioscorea bulbifera*) and *kayawal* (*D. transvera*) and the fern *manbulkung* (*Blechnum indicum*), that are not well adapted to frequent fire. Victor said "[rainforest has] been there from Dreamtime. You're not allowed to go there and make fire. Just leave it like that. Unless we get permission from land owners."

Research led by Jeremy Russell-Smith since the 1980s has shown significant decline in gondwanan species *manbinnik* (*Allosyncarpia ternata*) and *manlarrh* (*Callitris intratropica*), owing to destructive late dry season fires which have occurred as a result of the historical near abandonment of customary fire management activity on the Arnhem Plateau (Yibarbuk *et al*. 2001; Russell-Smith *et al*. 2009). Victor said that in the past people burnt country for kangaroo during appropriate seasons. These are the seasonal activities that Warddeken are using in their contemporary fire management activity to promote both the ecological and cultural integrity of the region.

Bininj 'caring for country'

From our discussions it became clear that for Victor and Barbara the conservation and maintenance of plants (like animals and country in general) is built into and therefore indistinguishable from the holistic *bininj* 'caring for country' philosophy which Victor might call 'the law'. This philosophy consists of a complex set of beliefs, rules and practices which relate to every aspect of life. It has existed for millennia and is still strong and alive in the minds and hearts of *bininj* today. This philosophy has in many cases now been adapted to deal with new threats to country and deploy new technologies. It is these combinations of *bininj* and *balanda* motivations, aims, knowledge and expertise that have driven the success of Warddeken Land Management Limited as a leader in two-way management of Aboriginal land.

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Links

More information about the ANU *People on Country* project can be found at <http://caepr.anu.edu.au/poc>.

Finding common ground in north-east Victoria

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In Victoria's north-east, Indigenous people and natural resource management (NRM) agencies are exploring the use of traditional knowledge and access to land and resources as triggers for building the capacity of Indigenous people to engage in NRM. This has been made possible through funding from the Australian Government's *Caring for our Country* initiative.

Retention of traditional ecological knowledge and land management practices by Indigenous people has been impacted by removal of Indigenous people from country early in the colonisation process and, more recently, through limited access to traditional land and resources.

Dedicated employment roles within the North East Catchment Management Authority (CMA) are paving the way to understanding links between the benefits of local Indigenous engagement activities and local NRM conservation projects. This article aims to share the results of combining Indigenous engagement activities with modern NRM conservation in north-east Victoria.

The catalyst: the Threatened Grassy Woodlands Project

There is a strong feeling amongst the region's Indigenous community about re-connection to the natural environment for physical, metaphysical and traditional reasons. A unique, cross regional project known as the Threatened Grassy Woodlands Project has successfully incorporated two key Indigenous engagement objectives to help address these local challenges.

This project set out to:

1. develop one Indigenous partnership by establishing and supporting an Indigenous Landcare group to engage and build capacity of an Indigenous community in north-east Victoria; and
2. deliver six Indigenous community engagement activities within priority woodland areas to facilitate knowledge sharing, capacity building and access to free information.

The project invests in the skills and knowledge of Indigenous people which in turn contributes to the conservation of a nationally important asset—threatened grassy woodlands.

Threatened grassy woodlands are one of Australia's most poorly conserved ecosystems, listed as endangered or critically endangered under the national *Environment Protection and Biodiversity Conservation Act 1999.* Our project specifically targets White Box–Yellow Box–Blakely's Red Gum Woodland and Derived Native Grasslands of the Riverina and Murray Darling Depression. These threatened woodlands also have significant value to Indigenous people.

In aligning the project with national priorities listed in the Australian Government's *Caring for our Country* Business Plan (2009–2010), a number of important triggers were identified as essential to successful Indigenous engagement in NRM. These were:

- developing projects which benefit both the local Indigenous community and the priorities set by the funding body, i.e. 'finding common ground'
- utilising knowledge and skills existing within the local Indigenous community that relate to the threatened Box-Gum Grassy Woodlands
- identifying the Indigenous community's knowledge and skill gaps so that local knowledge could be supported by participants from other Indigenous nations
- supporting participants so that they are not financially burdened by their participation
- identifying potential stakeholders who would benefit from the project such as health, education or other industries.

Indigenous Landcare group establishment

In a first for Victoria, the project led to the formation of an Indigenous men's Landcare group named *Bidja Bila* (Men of the river). The North East CMA's Indigenous Landcare Involvement Officer was employed specifically to establish and support this group. *Bidja Bila* supports local desires for a place to gather to rekindle traditional stories and practices, and encourages interaction between Elders and younger Indigenous people.

Landcare group members help plant trees along the Murray River on Gateway Island, Albury-Wodonga. Pictured in foreground left to right: Dick Murray (Duduroa man), Wayne Edwards (Yorta Yorta man), Desi Smith (Wiradjuri man); in background Ray Williams (Barkindji man), Richard Kennedy (Ngiyampaa man). Photo: courtesy of The Border Mail.

Weaving workshop hosted by Indigo Valley Landcare group and attended by (left to right) Ro Lavers (Indigo Landcare group), Chris Dormer (North-east Weaving Association), Sharon Edwards (Ngiyampaa woman), Cheryl Cameron (Wiradjuri woman) and Jackie Tansy (weaving facilitator). Photo: courtesy of The Border Mail.

The group was officially established via a Memorandum of Understanding. The group's first project was planting 500 native trees and grasses to provide future resources for the local Indigenous community and to enhance the understorey for species reliant on threatened woodlands.

The flow-on effects are proving positive. This Indigenous Landcare group is able to program activities that align with community priorities such as education, health and engagement of youth.

Indigenous community engagement

At the start of the Threatened Grassy Woodlands Project, an existing local Aboriginal advisory group spent time gathering ideas and planning activities. Activities were discussed in terms of their combined relevance in engaging the Indigenous community and in utilising the Traditional Ecological Knowledge about natural resources of Box-Gum Grassy Woodlands.

Engaging Aboriginal Elders and Traditional Owners during project planning stages helped to reinforce existing trust and cooperation between local Aboriginal communities and NRM agencies. It also empowered those involved to build the confidence and capacity to engage.

This planning led to delivery of a series of stone tool making and weaving workshops for the local Indigenous community. The knowledge of Elders from six nations was utilised. Elders were able to participate or to observe the application of Traditional Ecological Knowledge and techniques.

Both workshops utilised natural stone and plant resources derived from the Threatened Grassy Woodlands Project environment.

During the workshops some Elders talked about their recollections of seeing these practices as children. For others, the workshops were the first time that they had seen the traditional practices. Elders also talked about the value of Indigenous people networking across multiple catchment regions. A combination of young and old attendees saw youth benefiting from the Indigenous knowledge transfer, through demonstrations and practical participation.

Lessons learned

The North East CMA is using feedback provided by Indigenous participants to plan future project activities. Insights gained to date include:

- Projects need to be longer, ongoing and have financial support.
- Elders need financial support, as they find participation difficult due to their low economic status.
- The filming of projects not only records and preserves current knowledge but is a valuable resource for Indigenous communities in years to come.

- Youth engagement is essential to ensure knowledge transfer and capacity building for ongoing Indigenous participation.
- Projects are building participant and associated stakeholders' capacity to achieve NRM and Indigenous engagement outcomes together.
- Success of these engagement activities has inspired other Indigenous communities to consider forming Landcare groups, not only to address community issues, but to address environmental problems that are priorities in their communities.
- Projects have invoked pride within the Indigenous community, and recognition from the wider community.

Conclusion

Traditionally, looking after nature and its resources was a key responsibility of Indigenous people. Having been removed from this role, Traditional Ecological Knowledge and the role Indigenous people play in land management has suffered immeasurably. While many Indigenous people are now part of urban communities, the connection to the natural environment has not been lost. The activities undertaken through the Threatened Grassy Woodlands Project in north-east Victoria has reinforced the need for NRM agencies to involve traditional land owners in policy development and land management decisions, not only for future sustainability but also to assist in the preservation of our natural and cultural environment.

The use of Traditional Ecological Knowledge as a trigger to engagement and the formation of Indigenous Landcare groups in this region have had positive outcomes. It has been pleasing to observe this benefiting the local Indigenous community, the wider community and the environment.

Acknowledgements

We would like to acknowledge the funding and support of the Australian Government's *Caring for our Country* initiative, together with contributions from the North East, Goulburn Broken and Murray CMAs, the Victorian departments of Sustainability & Environment and Primary Industries, Trust for Nature, Nature Conservation Trust and the Australian National University.

Further information

Information regarding triggers to engagement: www.landcarevic.net.au/news/finding-common-ground-a-review-of-indigenous-engagement-in-landcare-in-victoria

Information on forming Indigenous Landcare groups: http://www.landcarevic.net.au/resources/for-groups/notes

Information about the project: www.necma.vic.gov.au/OurPrograms/ThreatenedGrassyWoodlandsProject.asp

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A collaborative pathway to Working on Country—the Northern Rivers journey

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Introduction

The parks and reserves of the Northern Rivers Region (the Region)[1], located on the far north coast of New South Wales (NSW), are part of the identity, spirituality, connection and resource base of the Bundjalung and Githabul Aboriginal people.

The Region encompasses 101 reserves, covering 210 973 hectares, 15 of which have World Heritage status and are part of the rainforests of Australia. It is the most biologically diverse region of NSW, and has 200 threatened plant and animal species, and seven endangered ecological communities.

An approach to cooperative management of areas of native title

Within the Region four Indigenous Land Use Agreements (ILUA) are in place, as described below. An ILUA is a voluntary agreement between native title claimants, or native title holders, and the NSW Government in the use and management of land and waters. These agreements can be made separately to the formal determination of a native title claim or can be a stepping stone towards, or part of, a formal native title claim determination by the Federal Court. The NSW Government can negotiate an ILUA with native title claimants regarding the management of public land in their claim area.

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[1] Northern Rivers Region of the NSW National Parks and Wildlife Service is part of the Department of Environment, Climate Change and Water, Parks and Wildlife Group.

Arakwal Indigenous Land Use Agreements

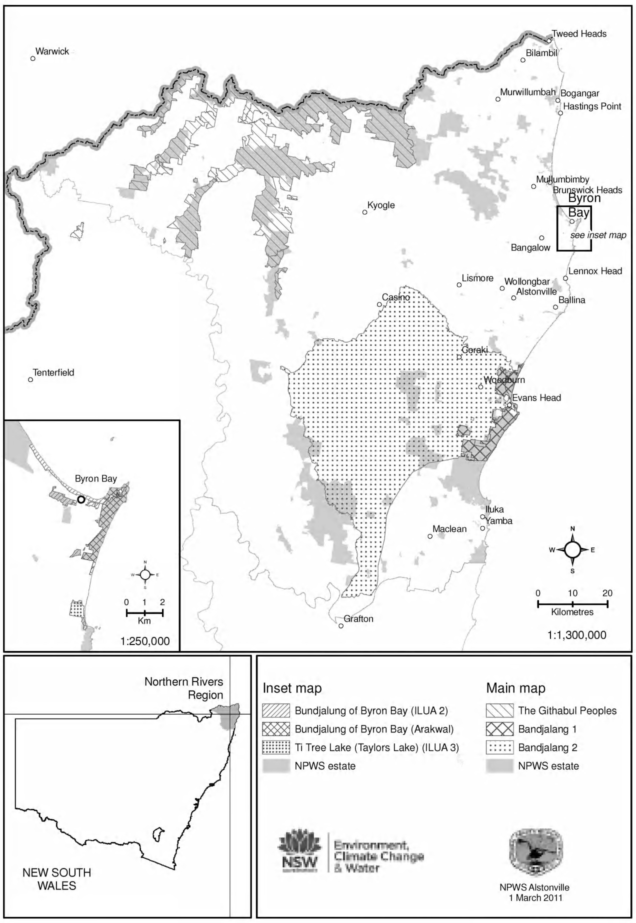
In August 2001, Arakwal National Park was the first National Park in Australia to be created under an ILUA with the traditional owners, Byron Bay Arakwal people, and the Department of Environment, Climate Change and Water in a joint management agreement. This Agreement was recognised internationally in 2003 by the International Union for the Conservation of Nature for distinguished achievements in wildlife preservation.

In December 2006, two new agreements were signed by the NSW Government and the Bundjalung People of Byron Bay (Arakwal). These are the Byron Bay Indigenous Land Use Agreement 2 and the Ti Tree Lake Indigenous Land Use Agreement 3. A total of eight parks and reserves are now covered by these agreements for joint management through the operations of the Arakwal Management Committee.

Githabul Indigenous Land use Agreement

The Githabul Indigenous Land Use Agreement was signed in February 2007 and involves 11 parks and more than 112 000 ha near Mt Lindsay, NSW. The Githabul Agreement is the largest area jointly managed in the state. Key to its implementation is the operation of the Githabul National Parks Management Committee. The consent determination recognises the native title rights of the Githabul People over National Park lands identified in the claim area, and is the first such determination over National Parks in NSW.

The Byron Bay Arakwal people's logo, worn by staff working in the Northern Rivers Region, represents their connection to the land and sea.



Map of the Northern Rivers Region showing the location of the Indigenous Land Use Agreement areas.

Bandjalang Native Title Land Claims

The NSW Government has been in negotiations since 2003 with the Bandjalang Native Title Claimants regarding Bandjalang Land Claim No 1 & 2. These claims cover 16 parks and reserves including all the Bundjalung National Parks and Bungawalbin Reserve areas covering 43 041 ha. A key aspiration of the Native Title Claimants is to undertake training and employment in land management activities both on and off the park estate.

Working on Country

The establishment of the Indigenous Land Use Agreements has provided opportunity for employment of local Aboriginal people. Full-time field officer, ranger and administration positions have been created in the management areas, including eight at Arakwal and four at Githabul. Similar positions may be created for Bandjalang Native Title Claimants. Another eight full-time Aboriginal staff work within the Region, totalling 20 overall.

Managing native plant communities: a planned approach

Managing native plant communities and threatened species is a high priority in the Region. Seven hundred and ninety two Priority Action Statement actions are identified for species and communities in the Region that are listed under the NSW *Threatened Species Conservation Act 1995*.

Implementing weed control and pest management actions is a high priority as part of managing these communities in the Region. Importance has been given to the development and implementation of plans that identify actions to restore and enhance the biological assets. Some of these plans include:

- the NSW Bitou Bush Threat Abatement Plan and individual site specific management plans;
- the National Plan to Protect Environmental Assets from Lantana, and individual site specific management plans; and
- individual species and site pest management plans and strategies, including restoration and rehabilitation plans.

Memorial planting in remembrance of Linda Vidler within Arakwal National Park. L to R: Mark Johnston, Danza Vidler, Mick Kay, Elder Dulcie Nicholls, Yvonne Stewart, Sue Walker and Delta Kay. Photo: NSW NPWS.

Our workforce: educational and training opportunities

There are 97 staff employed to manage the 101 parks and reserves in the Region, approximately 21% of the workforce permanently employed being of Aboriginal descent. Delivering on-ground outcomes identified in site plans or strategies relies on persons with appropriate skills and experience to deliver best practice conservation protection. Training commenced in 2005, in the nationally accredited Conservation and Land Management Certificates (CLM II, III, IV) in natural area restoration. Over 50 staff have been trained in various levels of the CLM Certificate with the majority at Certificate III level and three staff with completion of Certificate IV. Thirty eight per cent of those staff trained are of Aboriginal descent.

Tying science with cultural connection and spirit has enhanced the knowledge of local people. Additional mentoring and coaching has occurred since 2006 to complement the training. Specific training programs have also been conducted for Githabul People of the Kyogle area.

Seeking funding for on-ground works

Funding opportunities have been sought to undertake planning and implementation of weed control, such as through the NSW Environmental Trust and Commonwealth *Caring For Our Country* programs. Projects that are being delivered include restoration of endangered ecological communities such as littoral rainforest at Cape Byron Headland (Arakwal country) and Gondwana World Heritage rainforest sites like Murray Scrub in Toonumbar National Park (Githabul country).

A team of eight Githabul 'workings on country rangers' have been established under the Commonwealth *Working on Country* program. This project is a national first with the team working across approximately 110 000 hectares of national parks including parks within the Gondwana Rainforests of Australia World Heritage Area. The team initially focused on controlling Weeds of National Significance, particularly Lantana, and introduced vine species around areas of high cultural significance to the Githabul People. Currently they are developing interpretation and education activities to increase visitor knowledge of the values of the area, and developing skills that will assist the Department of Environment, Climate Change and Water and the Department of Industry and Investment in the future with threatened species, habitat and fire management programs.

Further information

More information about these programs can be found on the following web sites:

- http://www.environment.nsw.gov.au/jointmanagement
- http://www.environment.nsw.gov.au/jointmanagement/indigenouslanduseagreement.htm
- www.environment.nsw.gov.au/lantanaplan/
- www.environment.nsw.gov.au/bitoutap/

CASE STUDY:
Place of Plenty—the Arakwal ethnobotanical study

Through the Indigenous Land Use Agreement for Arakwal National Park the community have continued to harvest wild resources there. A study *Place of Plenty* was initiated to benefit park management, cultural renewal and cultural tourism programs, and to promote the bush foods and medicines in the lives of Aboriginal people.

The publication *Place of plenty: Culturally useful plants around Byron Bay* is being used by the Byron Bay Arakwal people in their cultural renewal and cultural tourism programs, to educate their children and grandchildren, along with visitors to the park, about their culture and the lands around Byron Bay.

In addition, the project has stimulated discussions between community members and National Parks and Wildlife Service staff about how park management activities, such as fire and pest species control, might be carried out in recognition of Aboriginal values. Revegetation and coastal restoration programs on land affected by sandmining involve the Aboriginal community to ensure that the appropriate species are replanted to restore the landscape.

Working with Anangu to conserve rare plants in the Anangu Pitjantjatjara Yankunytjatjara Lands of South Australia

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Introduction

The Anangu Pitjantjatjara Yankunytjatjara Lands occupy 103 000 km^2 of north-west South Australia. Although the Lands have remained unaffected by any significant development (e.g. large-scale land clearing), there have been marked changes to the vegetation via a number of processes, e.g. diminished traditional burning practices and the introduction of feral herbivores and exotic plants. Despite these processes and changed climatic conditions, the Anangu Pitjantjatjara Yankunytjatjara Lands' mountain ranges—Tomkinson, Mann, Musgrave, Everard, and Indulkana—provide refugial habitats, such as permanent rockholes, sheltered gorges, rock slabs, and high peaks for a number of rare and relic plant species.

The remoteness and inaccessibility of the ranges of the Anangu Pitjantjatjara Yankunytjatjara Lands provide challenges for their survey and management. Fortunately many Aboriginal people, known locally as Anangu, live in close proximity to the ranges and retain an intimate knowledge of their country's flora and fauna. Anangu knowledge has provided important contributions to the conservation of the region's biota (e.g. Robinson *et al. 2003*).

Plant monitoring program

In 2009 scientists worked with Anangu traditional owners and rangers to establish a five year monitoring program for rare plants in the Anangu Pitjantjatjara Yankunytjatjara Lands (Paltridge *et al*. 2009). The project aimed to:

- conduct aerial and ground surveys to increase knowledge of the distribution and abundance of selected rare plants; and
- establish long-term monitoring sites that will provide information on responses to disturbances such as fire, weed invasion, browsing by feral animals and changing climatic conditions.

The 12 target species (Table 1) selected for the project ranged from those which may be locally abundant but have very limited distributions, to more geographically widespread species thought to be facing regional extinction. Threats to some of these species are discussed below.

Threats

Buffel Grass

Two of the rarest plants in the Anangu Pitjantjatjara Yankunytjatjara Lands, the Everard Garland Lily (*Calostemma abdicatum*) and the Showy Germander (*Teucrium reidii*), are threatened by the invasion of Buffel Grass (*Cenchrus ciliaris*) (Figure 1), which occurs on the edges of the best known stands of both species. Buffel Grass, an introduced pasture and erosion control species, has spread rapidly since its introduction to central Australia in the 1960s. Its vigorous growth allows it to outcompete native species and significantly increase fuel loads. Broad scale control of Buffel Grass in the Anangu Pitjantjatjara Yankunytjatjara Lands is not possible with currently available techniques. Management of small, isolated populations is achievable, and with regular and ongoing control efforts it should be possible for Anangu rangers to prevent any further encroachment of Buffel Grass into rare plant populations.

High fire frequency

While most plant species in the Anangu Pitjantjatjara Yankunytjatjara Lands are adapted to fire in some way, many of the rare plants and plant communities in the region are restricted to fire shadow areas that burn only

Table 1. List of target species surveyed.

Scientific name	Common name
Acacia ammobia	Mount Connor Wattle
Acacia oswaldii	Umbrella Wattle
Acacia tenuior	Central Ranges Wattle
Calostemma abdicatum	Everard Garland Lily
Cremnothamnus thomsonii	Cliffside Daisy
Eremophila willsii subsp. indeterminate	Musgrave Ranges Fuschia
Goodenia brunnea	Central Ranges Goodenia
Lepidosperma avium	Central Australian Rapier Sedge
Melaleuca fulgens subsp. *corrugata*	Wrinkled Honey Myrtle
Prostanthera nudula	Mount Ilbillee Mintbush
Santalum acuminatum	Quandong
Teucrium reidii	Showy Germander

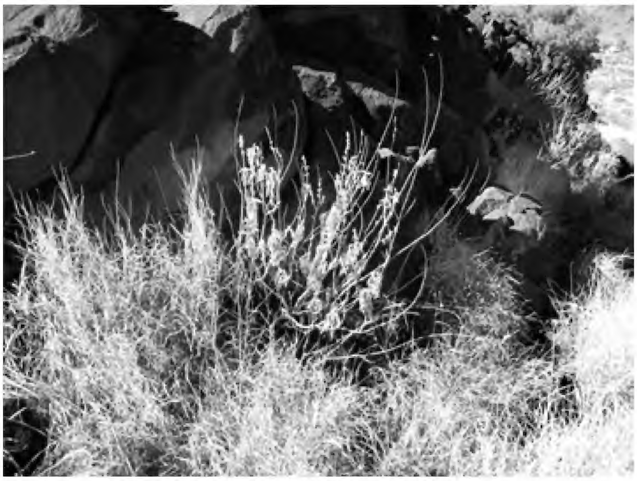

*Figure 1. Showy Germander (*Teucrium reidii*) surrounded by Buffel Grass (*Cenchrus ciliaris*). Photo: Alex Pickburn.*

occasionally, suggesting that high fire frequency is a limiting factor for such species. The Wrinkled Honey Myrtle (*Melaleuca fulgens* subsp. *corrugata*) is an example of a plant that may be threatened by fire. Capable of resprouting after occasional fires, local extinction of this species has been observed after a series of three fires in 30 years. It currently has a highly fragmented distribution across the Central Ranges bioregion, occurring only at one or two sites on the highest peaks of the various range systems. Its total area of occupancy is thought to be less than 5 km^2.

The mechanism by which fire is causing a decline in abundance of Wrinkled Honey Myrtle is not fully understood but is thought to be associated with the impacts of fire on soils. Hills that are frequently burnt are vulnerable to losing their soil through wind and water erosion when the vegetation cover is removed. Once the quality and quantity of soil has deteriorated, habitats become more suitable for spinifex (*Triodia* sp.) colonisation. As spinifex becomes established, the hills are prone to more frequent fire, and species adapted to more infrequent burning can no longer persist.

A similar process may be occurring for two of the other target species surveyed—Mt Ilbillee Mintbush (*Prostanthera nudula*) and Central Australia Rapier Sedge (*Lepidosperma avium*)—which both grow in pockets of soil at the base of large rock slabs. This microhabitat is vulnerable to soil erosion when fires remove the vegetation growing on the upper slopes of the hills which would normally impede the flow of water. Increased water velocity after fire can result in soil loss at the base of the rocks. Thus the recommended management for these species is to create fire breaks in the vegetation upslope of the plant populations. A fire management plan has been produced for the ranges of the Anangu Pitjantjatjara Yankunytjatjara Lands that prescribes fuel reduction burns to be conducted in the cooler months to limit the spread and intensity of wildfires in the hot season.

Protecting Quandong trees

Of all the plants surveyed during this project, the Quandong (*Santalum acuminatum*) is the species that is most relevant to Anangu because of its importance for both food and artefact production. It is also the species for which local extinction is most imminent, primarily due to over-browsing by feral camels (see Figure 2). Fire also causes death of Quandong trees, and rabbits destroy seedlings. Overharvesting of Quandong trees for the *punu* (wood carving) industry has also contributed to reduced population sizes, however art centres now discourage use of Quandong for artefact production.

Fortunately, Anangu have an excellent knowledge of the remaining Quandong populations on the Anangu Pitjantjatjara Yankunytjatjara Lands and have been instrumental in establishing monitoring sites for this species. Localised actions recommended to protect Quandong trees include fencing off the best stands and conducting fuel reduction burns around trees. Broadscale actions to expand current populations include widespread camel culling and fire management.

Conclusion

With on-going management actions (especially weed control and prescribed burning) by Anangu Traditional Owners and rangers, the threatening processes that face many rare and threatened plants in the Anangu Pitjantjatjara Yankunytjatjara Lands can be ameliorated.

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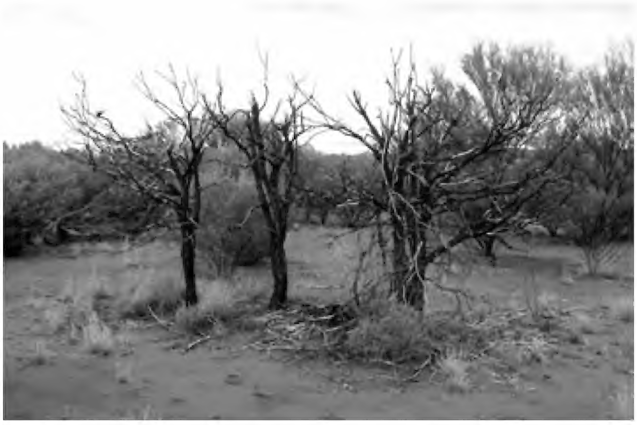

*Figure 2. Dead Quandong (*Santalum acuminatum*) trees showing signs of camel browsing. Photo: Alex Pickburn*

Anmatjerre traditional ecological knowledge and conservation of Antjulkinah, the Giant Sweet Potato

Beth Crase[1], Angus Duguid[2], Raymond Nelson Pengart[3], Paddy Willis Jakamarra[3], Laurie Price Angal[3], Margaret Scobie Pengart[3], Aggie Woods Kemarr[3], Andrew Rayner[4] and Richard Tuckwell[4]

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Introduction

The Northern Territory (NT) covers a vast area, stretching north from the arid zone in Central Australia almost 2000 km to the northern tropical coast, and encompasses just over 1.3 million km^2. More than 4500 plant taxa have been recorded in the NT, of which 567 are found nowhere else in the world. However, 707 plant taxa (15.7 per cent) in the NT are so poorly known they are coded as 'data deficient', meaning their conservation status cannot be reliably assessed.

Information about the distribution of rare plant species is critical for determining their conservation status, but surveying the extensive and remote areas of the NT to record rare plant species is difficult, time consuming and expensive. However, there is a rich resource which can help in this search—the ecological knowledge held by the Indigenous Traditional Owners of various regions in the NT. Traditional ecological knowledge is the detailed knowledge of plants, animals, natural events and processes that Indigenous people have acquired over a long period of intimate contact with the environment.

Mapping *Antjulkinah*, the Giant Sweet Potato

The Anmatjerre people, Traditional Owners for an area to the north of Alice Springs, and botanists from the Biodiversity Conservation Division of the Northern Territory Government worked together on a project to locate and map a very rare plant called *Antjulkinah* or the Giant Sweet Potato (*Ipomoea polpha* subsp. *latzii*) in the plant family Convolvulaceae. This plant only occurs on Anmatjerre land, although it is known to neighbouring Indigenous groups, for example the Kaytej, Warlpiri and western Alyawarra (Soos and Latz 1987). A survey in 1987 found that the taxon was restricted to two sub-populations within an area of approximately 9 x 13 km^2 (Soos and Latz 1987).

Antjulkinah has large purple flowers and grows in long trailing tillers across the ground; edible tubers grow under the ground and can weigh up to eight kilograms (Figure 1 and front cover). The tubers are either roasted on a fire or eaten raw, and taste similar to a water chestnut. *Antjulkinah* features strongly in the mythology of the Anmatjerre people and they have special songs for locating the plants and for "singing him up" (Soos and Latz 1987).

Botanists and the Traditional Owners met three times and camped near the area where the Giant Sweet Potato occurs. Central Land Council staff arranged the meetings and recorded cultural knowledge that the Anmatjerre people wanted written down. The Anmatjerre Traditional Owners and botanists worked together to re-map the boundaries of the sub-populations (Figure 2) and botanists recorded *Antjulkinah* along transects to improve the accuracy of population boundaries and to estimate the total number of

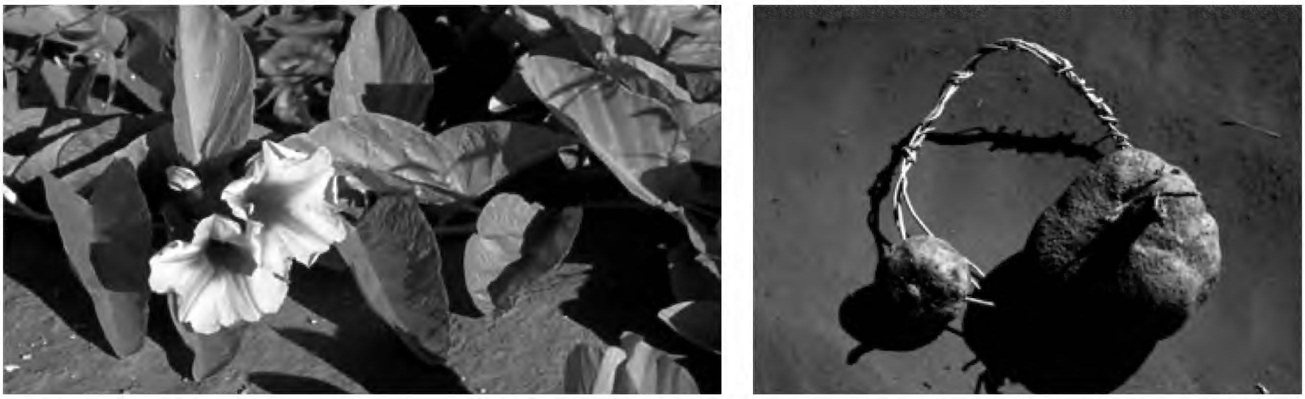

*Figure 1. Antjulkinah or Giant Sweet Potato (*Ipomoea polpha *subsp.* latzii*) showing flowers (left) and tubers (right). Photos: Peter Latz (left) and Antal Soos (right).*

Antjulkinah plants. Traditional Owners gave the botanists clear instructions about where they could and couldn't go and other cultural protocols to observe.

The Traditional Owners guided the group to a third sub-population of *Antjulkinah* not previously recorded by botanists. This 'new' sub-population covers an area at least as large as the other two sub-populations of the plant.

Population changes of *Antjulkinah*

Since the survey made in 1987 the distribution of one sub-population had apparently expanded to the south, while the other sub-population had apparently expanded in almost all directions. The average density of the two studied sub-populations was estimated as one mature plant per hectare in 1987 and between 18.7 and 48.4 plants in the most recent survey. The estimated total number of Antjulkinah plants in these sub-populations ranged from about 39 000 to 125 000 individuals, substantially greater than the 1987 estimate of 11 000 plants.

Assessing the conservation status of *Antjulkinah*

Recording of a new sub-population, meticulous mapping of the two known sub-populations and estimation of the total population size enabled a more accurate and informed assessment of the conservation status of *Antjulkinah* under the IUCN 2008 guidelines. Although there are many individual plants within the sub-populations, there are only three sub-populations restricted to a geographically small area. Threatening processes such as increased frequency and intensity of bushfires, damage from stock by grazing or trampling and drought or disease could affect the whole population of *Antjulkinah*, and it was therefore coded as Vulnerable (see Crase *et al.* 2010).

Conclusion

The collaborative bicultural approach that was effective for *Antjulkinah* could be used to assess the conservation status of other rare plants. Although not all rare species are of cultural importance to Indigenous custodians, rare taxa are more likely to be culturally important when the plant is (i) used for food or medicine; (ii) large, abundant or unusual; (iii) spiritually significant; or (iv) has a relationship to other important species, for example, if culturally significant animals browse or visit hollows (Baker *et al.* 1993; Nabahan 2000). Where a rare plant taxon has any of these four traits, cooperative research with Indigenous communities could be developed to collect distributional and ecological data. There is already legislative support for this in the *Environment Protection and Biodiversity Conservation Act 1999*, in which section 3(1)(g) explicitly encourages co-operation with Indigenous people and highlights the value of traditional ecological knowledge.

Traditional ecological knowledge is a valuable resource for the accurate assessment of the conservation status of rare species and can augment other kinds of data collection as well as improving survey efficiency.

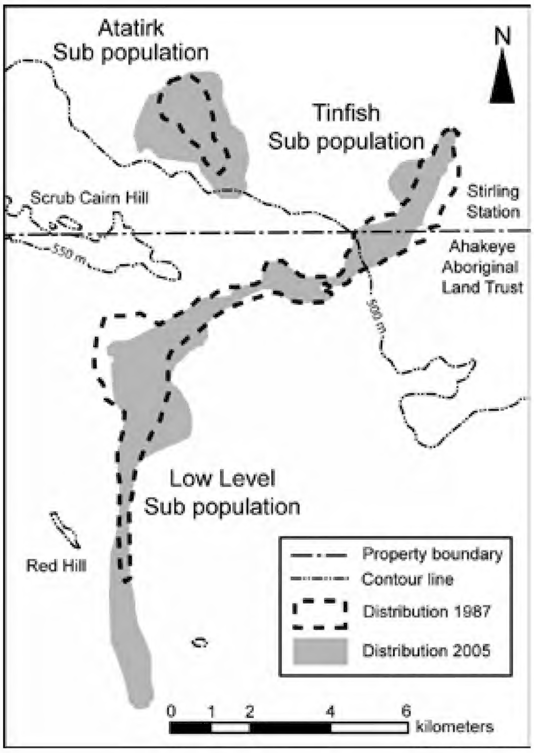

*Figure 2. Map of two sub-populations of Antjulkinah, or the Giant Sweet Potato (*Ipomoea polpha *subsp.* latzii*). Dashed lines indicate the sub-populations previously known to Biodiversity Conservation Division botanists from the 1987 survey; grey shading shows the distribution mapped in 2005.*

Acknowledgements

We thank Murray Nelson Pengart, Ray Nelson Pengart, Peterson Stewart Pengart, Reggie Stewart Pengart, Michael Nelson Pengart, Nancy Woods Kemarr, Tommy Woods Kemarr, Eva Woods Kemarr, Laurie Price Angal and Paddy Willis Jakamarra for their participation; Tim Collins, Kasia Gabrys, Andrew Greenwood and Ben Sparrow from the Parks and Wildlife Service of the Northern Territory and the Alice Springs Desert Park for assistance with field work. We are grateful to Glenn Wightman for his thoughtful comments and suggestions. This study was supported by the Australian Government Cooperative Research Centres Programme through the Desert Knowledge CRC (DK CRC); views expressed here do not necessarily represent the views of DK CRC or its participants.

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People and plants in Arnhem Land: maintaining ecological and cultural assets using Aboriginal and non-Aboriginal techniques

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Introduction

Arnhem Land has been inhabited by Aboriginal people for at least 50 000 years and remains a stronghold of Aboriginal culture and community (Chaloupka 1993). Like many first peoples, Arnhem Landers have fundamental and enduring connections to country with intricate ecological and cultural knowledge of flora, fauna and ecosystems, particularly those utilised for food, water, medicines, shelter, utensils, seasonal indicators, art, ceremonies and other cultural purposes.

Aboriginal people have managed land and sea resources for millennia. However, since the European colonisation of Australia, new threats to country and cultural knowledge of country have emerged. The introduction and spread of feral animals and exotic plant species, the collapse of customary fire management regimes due to depopulation of ancestral lands, and the effects of climate change have and continue to degrade and alter the ecology of the landscape (Altman *et al.* 2007). External influences have also dramatically affected customary lifestyles and the processes and activities required for effective ongoing transmission of customary knowledge and skills between generations.

Contemporary approaches to Aboriginal land management aim to address these threats by supporting the return and reconnection of people to country and culture and encouraging community-based natural resource management using a 'two-toolbox' approach—the respective knowledge systems and techniques of Aboriginal people and western scientists.

The following two examples describe how we, as non-Aboriginal scientists, have been working with communities in Arnhem Land to conserve plants and culture.

Assessing buffalo damage in permanent freshwater wetlands

Over the past two years we have been working with four Aboriginal land and sea management groups (Ranger groups) throughout Arnhem Land (see Figure 1) to document the ecological and cultural impacts of feral Asian water buffalo (*Bubalis bubalis*) in permanent freshwater habitats (Ens *et al.* 2010). A secondary aim was to develop the ecological monitoring capacity of these Ranger groups which required adapting project methodologies to suit the skill-level, interests, priorities and resources of each group. Different approaches were therefore adopted in each area. For example, the Yugul Mangi Rangers wanted to erect exclusion fences around some billabongs which also were significant cultural sites, and the Yirralka Rangers wanted to use *Yolngu Matha* (local Aboriginal language) when collecting data.

Technologies such as handheld computers, CyberTracker data collection software, water quality meters and digital cameras were used to collect information on ecosystem health and levels of feral animal damage. Use of these technologies made the monitoring easier, by removing the need for pen and paper, and also more enjoyable which was important to maintain the interest of participants. It was anticipated that by engaging the local Rangers in the project from start to finish, the Rangers would gain the necessary skills and understanding to critically analyse the real impacts of feral buffalo through observation and measurement of changes across the landscape and through time (seasons and years). This information could then be used to inform local management plans.

An integral part of this project was the collection of baseline botanical data for floral inventory purposes and as a tool to monitor the ecological outcomes of land

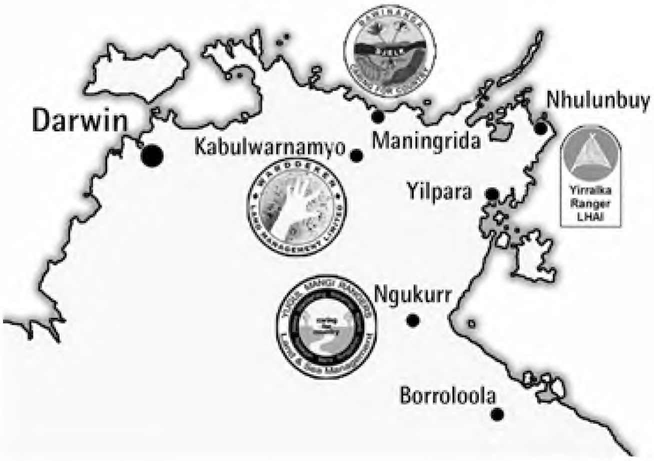

Figure 1. Location of Aboriginal Ranger group partners in Arnhem Land, Northern Territory. Image: John Hughes.

management activities. Training was provided in scientific plant collection techniques, specimen vouchering, plant identification and data recording methods. For many participants, this was the first time they had conducted scientific monitoring and systematically collected plants for the purpose of biological assessment. In each area we have established and continue to develop local herbarium reference collections that include both western scientific and Aboriginal language names of species. This work has been particularly embraced by the Warddeken Manwurrk Rangers with whom we have expanded the project to also include macro-algae surveys and the recording of cultural plant knowledge using digital media.

Recording cultural plant knowledge

Aboriginal people have a very long history of oral knowledge exchange. Information about the cultural and spiritual aspects of country and how to look after country by visiting, burning and clearing waterholes, for example, is passed on through songs, stories, art and ceremonies. Elders in the communities we work in have repeatedly asked us to help record Aboriginal knowledge of country. As mentors and knowledge holders, they are concerned that culture, language and inherited knowledge are disappearing and want these vital aspects of local culture documented and preserved for present and future generations. “Our old people are the most important resource that we have. More important than anything else. We need to work with them as much as we can, especially recording their knowledge, documenting it so it can be passed on. We must do this before it is too late. Because once they go then *bonj*, that’s the end. We can’t bring them back.” (quote from Terrah Guymala, Warddeken Land Management Limited 2010).

At Kabulwarnamyo, senior elder Mary *Kodjdjan* Kolkkiwarra asked us to help record *Kunwinjku* (local Aboriginal language) plant names and uses with her and other community members (Figure 2). To make the knowledge accessible to the community and the project more enjoyable we decided to make a film about different plants at specific places. We worked in a participatory way with people to record the information and edit the film footage. Training in the use of video cameras and film editing software was provided to enable the community to undertake their own knowledge recording on country.

So far, we have filmed information on 40 plant species and included 30 in the final film which gave details on the names and uses of bush tucker and useful plants of *Kunumeleng* (*Kunwinjku* season of high humidity before the wet season). During our first screening of the film at Kabulwarnamyo it became evident that the project and use of film media to document the information was a success. As the names of plants appeared, people in the audience repeated them and then spoke more about the plants and places, sharing more knowledge.

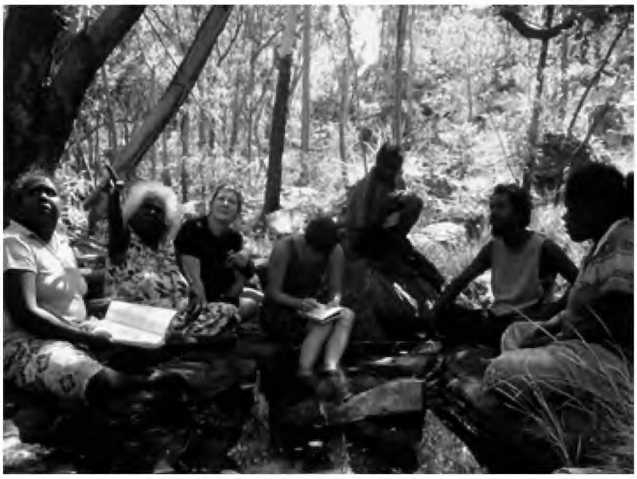

Figure 2. Recording Aboriginal plant knowledge near Kabulwarnamyo on the Arnhem Plateau. From left to right: Amy Namarnyilk, Mary Kolkkiwarra, Gill Towler, Emilie Ens, Larissa Daylight, Emmanuel Namarnyilk and Joylene Cameron. Photo: Sam Bentley-Toon.

Concluding remarks

Arnhem Land is globally recognised for its natural and cultural values. It has high endemism and diversity but is also exposed to a number of ecological and cultural threats. These examples show how successful projects can be collaboratively developed with local Aboriginal people to conserve ecological and cultural assets of Aboriginal land while also potentially offering socio-economic outcomes in the form of employment, education and community engagement.

Acknowledgements

We thank the Sidney Myer Fund for financially supporting this work through their Poverty and Disadvantage program. Thanks also go to our friends and colleagues in Arnhem Land, especially Mary Kolkkiwarra, Cherry Daniels, Georgia Vallance and Peter Cooke, without whom this work would not be possible.

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Indigenous plant conservation, Guanaba Indigenous Protected Area, Queensland

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Introduction

The Guanaba Indigenous Protected Area (Guanaba) comprises about 100 hectares of land in the Gold Coast hinterland overseen by members of the Ngarang-Wal group of the Gold Coast. The land borders part of the right bank of the upper reaches of Guanaba Creek that flows into the Coomera River. The westerly extent reaches into the foothills of Tamborine.

Apart from Indigenous values, there exists on-ground evidence of early settler exploitation. Nevertheless, Guanaba has retained much of its natural vegetation—that is, if one discounts invasion by exotic plant species.

That Aboriginal people accessed the area prior to European contact is not disputed, given the presence of stone tools and other lithic material both on and immediately adjacent to Guanaba. The 'clincher' for past local Aboriginal exploitation of the property and its immediate surrounds lies not only in the presence of animal foods but more importantly permanent fresh water. Additionally, a wide range of economic plants would have been used on a seasonal basis. While some of these plant species made up the food economy, there are many that found use in fish poisoning activities as well as in the manufacture of practical camp and hunting items. Some plants also provided material for medicinal uses.

Traditional values of plants

Some local Aboriginal cultural values may have been lost, but evidence is recorded locally of the use of the seasonal flowering of some plants for cultural purposes, such as the best time to seek out certain animal foods. These plants have become known as 'indicator' species. Additionally, some vegetation may not have had an obvious value except that birds and some other animals would congregate at fruiting times for feeding, at which time they were subsequently exploited.

Some fruits were downright distasteful (or even poisonous) to humans but not so to some animals. The trees and shrubs that had this characteristic allowed for the exploitation of fruit pigeons, figbirds and the like, as well as some arboreal mammals. Species that produced poisonous fruit were not necessarily ignored. Two capable of being treated to remove toxins include one of the Zamia Palms (*Lepidozamia peroffskyana*) and the Moreton Bay Chestnut or Black Bean (*Castanospermum australe*). There are others in this category.

Using historical knowledge

The Guanaba Indigenous Protected Area group is currently making use of the knowledge gained from professional research, including reviews of historical literature of Aboriginal vegetation usage. The information has been used to produce brochures and install signage for their membership as well as for visiting primary, secondary and tertiary students. Some of the 'economic plants' are described below.

Plant-food resources

Food species located on or adjacent to Guanaba receive mention in a range of historical records from the 19th century. The most obvious to the casual visitor include two species of Macadamia (*Macadamia integrifolia* and *Macadamia tetraphylla*), two Raspberry species (*Rubus rosifolius* and *R. hillii*) as well as the so-called Blue Fig or Blue Quandong (*Elaeocarpus grandis*). Additionally, the Bangalow or Piccabeen Palm (*Archontophoenix cunninghamiana*) provided food from the core of its upper stem.

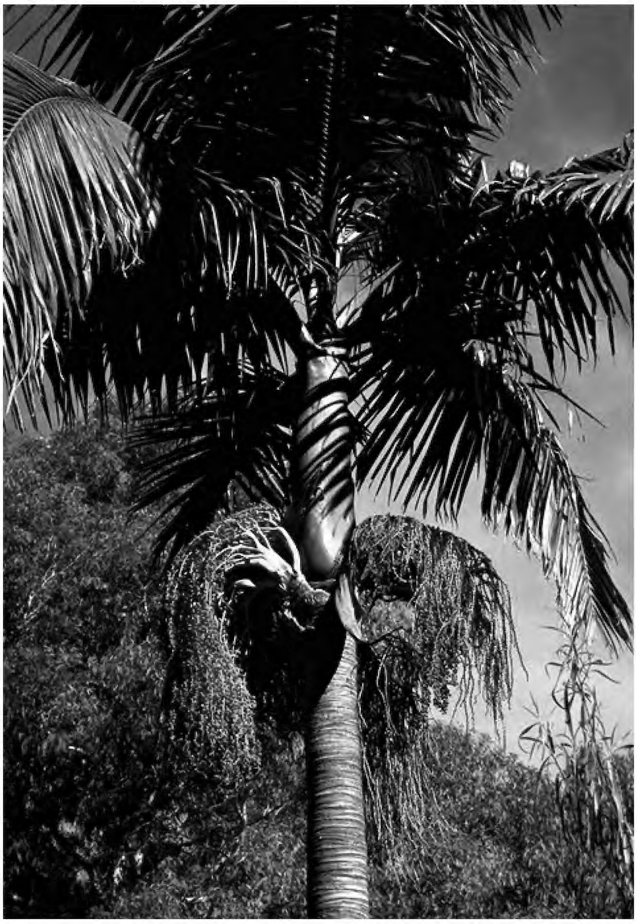
The Finger Lime (*Microcitrus australasica*) has been recorded as well as the Pencil Yam (*Dioscorea transversa*). On the flats of the western side of Tamborine Mountain, this yam was a staple food. Another food species, the Creek Lilly Pilly (*Syzygium australe*) is currently bearing fruit on Guanaba while the Common Lilly Pilly (*Acmena smithii*) is also found in the area. Native grape species (*Cissus* spp.) also trail along the lower branches of the riparian shrubs.

Most fig species are edible but arguably one of the 'better' ones includes the Sandpaper Fig (*Ficus coronata*) that exists in significant numbers on the property. Another recently located fruiting shrub of Guanaba is the Native Guava (*Eupomatia laurina*). The flesh is sweet, but the seeds are bitter.

There are quite a few small trees or shrubs of Native Mulberry (*Pipturus argenteus*) that seasonally bear small but tasty whitish fruit that have a speckled skin. Its local native name *kumuru kumuru* is believed by some to be the origin of the place-name for Coomera. It could only have been a seasonal snack food as with the Native Guava.

Fish poison species

Many species used to poison fish tend, rather appropriately, to grow in the vicinity of the freshwater streams. Recorded in the literature are several that 'fit the bill'. Two are medium sized trees: White Cedar (*Melia azedarach*) and Foam-Bark (*Jagera pseudorhus*). The bark and sometimes the leaves were bruised to release the toxins. The well-known Tape Vine (*Stephania japonica*) and so-called Smart Weed (*Persicaria hydropiper*) also found use for poisoning fish on the Gold Coast. Some wattles on the property were also possibilities, such as A*cacia falcata* and *A. melanoxylon.* The bruised parts of these species were usually crushed and swirled in the waters to immobilise the fish. The flesh of the fish was in no way toxic to the consumer.



Two Aboriginal food source plants in Guanaba Indigenous Protected Area: Archontophoenix cunninghamiana *(top) and* Acmena smithii *(bottom). Photos: M. Fagg.*

Species for manufacturing camps items and weapons

Most Aboriginal people owned dilly bags. In hinterland areas, the material of choice for making twine appears to have been the mat rushes (*Lomandra longifolia* and *L. hystrix*), while those on coastal areas preferred fine-leafed swamp grasses. Many *Acacia* species also served the purpose: barks were stripped and used for tying, including the binding of corpse bundles. Other useful cord-producing species were *Commersonia fraseri* and Settlers Twine (*Gymnostachys anceps*) that grows prolifically in places.

The Piccabeen Palm leaves made useful roofs for huts, while acacias and selected eucalypt species were useful in spear making. The *kurrungal* tree (*Dissiliaria baloghioides*) produced timber used for fashioning into sturdy fighting weapons such as nullas. For boomerangs, the locals may have fashioned the natural bend in the slender trunk and root of *Streblus pendulinus* that also produces a small, waxy, edible fruit. Supplejack (*Flagellaria indica*) found use in hoops for climbing trees. Strips from its black cane made cord for tying the ends of canoes and in fashioning fish traps.

Medicinal plants

Medicinal plants are limited in Guanaba and immediately beyond. Supplejack had a wide range of medicinal values: its leaves were used to heal wounds and in some places were used as a contraceptive. Sore eyes were also treated with the tips of the trailing vine. The milky latex of the food plant *Ficus coronata* aided in the treatment of cuts and scratches. The Red Ash (*Alphitonia excelsa*) was also useful (as a lather) in disinfecting skin ailments and treating sore eyes.

Although the grass *Cymbopogon refractus* has no known or recorded local use, its lemony odour when crushed and added to a slow fire provided some relief from childbirth pain. The grass was used particularly in the northern parts of the country.

Plant conservation

Recognition of the indigenous values of Guanaba to past traditional owners is a prerequisite to the development of good conservation practices there. The Indigenous Protected Area has used working parties of various types as well as professional people working in concert with the Aboriginal co-ordinator, Tony Dillon.

Activities taken to help conserve the area's economic plants include planting mat rushes to help stabilise the creek banks, and collecting seeds of Settlers Vine and seedlings of *kurrungal*.

Indigenous plant conservation in the Guanaba Indigenous Protected Area is well in hand.

Boorabee and The Willows Indigenous Protected Area, New South Wales

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Introduction

Glen Innes is located in the Northern Tablelands of New South Wales, 100 kilometres from the border with Queensland. It is also home to the Aboriginal nation of the Ngoorabul people.

The Glen Innes local Aboriginal Land Council purchased land approximately 25 years ago. The Ngoorabul people, the Traditional Owners, purchased adjoining land eight years ago. In March 2010 approximately 3000 hectares was declared an Indigenous Protected Area by the local Aboriginal people. Today we manage the properties for conservation, and longevity, the same as our ancestors did centuries ago.

The two properties are called The Willows and Boorabee, Boorabee meaning Koala in the local Ngoorabul language. These properties adjoin and are divided by the Severn River. Both properties provide significant amounts of bush tucker and medicinal plants. Some of these we are just starting to learn about again. The river also provides a valuable resource as well as being culturally significant in its own right. Our people come back on country to fish for cod and cat fish.

Looking after threatened plants

As part of our planning process we have identified some rare and threatened species, one of these being *Astrotricha roddii*. This plant has only been found on The Willows in one section on the south-eastern section of the property. It is located in a very small area of about 50 square metres in between granite boulders, in three distinct groups. They seem to be quite healthy with (we think) goats being the main threat by eating the new leaves and gnawing on the bark of the stems. This year we will be looking at trials on these plants, including fencing one area off from the goats, one area to have a slow burn in autumn put through, and trialling ways of propagation. If propagation is successful we will look at other areas of the properties to re-establish this plant. This will also reduce the risk of wild fire decimating the only known population that we have.

Through the biodiversity study we have also identified the Purple Donkey Orchid (*Diuris parvipetala*) and found two specimens of it. This species is only known in small areas throughout the State. The biggest threat to it is wild pigs digging up the ground, and the introduction of the weed Coolatai Grass (*Hyparrhenia hirta*). Spraying of the grass close to the orchid is restricted so the grass needs to be pulled out by hand or shovel if possible.

The Severn River Gorge is part of the dividing line between The Willows and Boorabee. Photo: Karen Potter.

We also have a number of common ground orchids such as chocolate orchids and fringed lilies; the cultural values of these are now being taught to our younger generation, and the wider community. Narrow Goodenia (*Goodenia macbarronii*) was located in a wet gully area. As an existing track goes through this gully, management of this plant has highlighted the area as a sensitive one and vehicles are required to stay on the existing track and not travel on it when wet and boggy.

Propagating bush tucker and medicinal plants

The Willows is the key area for education about the cultural landscape. This year will see the start of the up-grade of walking tracks, with educational signage being installed. One of the key features is to re-establish bush tucker and medicinal plants along this walkway for educational purposes. These plants are growing elsewhere on the properties and propagation of these will be done on-site with the establishment of an indigenous native nursery.

Ensuring food trees for koalas

The two properties also have a koala population. The koala is significant to the local Ngoorabul people, being their totem species. Both properties have areas to be rehabilitated. The emphasis is to plant out the endemic koala food trees *Eucalyptus viminalis*, *E. melliodora*, *E. blakelyi* and *E. dealbata*. Collection of seed from both properties for propagation will take place this year after flowering.

Managing a threatened ecological community

There is some 500 hectares of box-gum grassy woodlands that we manage for conservation. The box-gum grassy woodlands community has been listed as endangered under the NSW *Threatened Species Conservation Act 1995* under the name 'White Box-Yellow Box-Blakely's Red Gum Woodland', and Critically Endangered under the Federal *Environment Protection and Biodiversity Conservation Act 1999* under the name 'White Box-Yellow Box-Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands'.

We plan to re-establish the Grassy Box Woodlands back into areas that have been cleared previously. We will be trialling different methods including direct planting, and re-introducing fire stick farming methods that our ancestors carried out on this land many years ago. Revegetation of these areas is important and is high on our list of activities.

The woodlands and areas of native grasses provide an ideal habitat for a diversity of bird life. Surveying has identified 140 bird species, 16 which are listed as threatened in NSW under the *Threatened Species Conservation Act 1995*. An additional 13 nationally or state listed threatened species are found either on the property or known in the general area, and 17 species of bird are recognised as woodland species that are declining or at a particular risk from habitat loss and fragmentation across their range. All these bird species rely on our properties for food and use our trees for breeding. We will continue to manage for the biodiversity of all species on the properties.

Weed control

We have just experienced the wettest months here in the tablelands for some time. Aboriginal people have long appreciated the rain; it is one way to cleanse the earth and bring life back. But the down side to the tremendous floods and wet season that we have had is the deposition of large numbers of weed seeds along the banks and flood lines of the Severn River. Therefore eradication of weeds especially along the creeks and the river will be a priority, before flowering and seed dispersal happens. The majority of this will be done by spraying, with hand clearing carried out in sensitive areas.

One of the many species of Hibbertia *found in our Indigenous Protected Area. Photo: Karen Potter.*

A better environment for all

Through caring for country's Indigenous Protected Area process we have employed four of our local people to work on a casual basis to start to implement the activities and management strategies outlined in our management plan. Three of these are local Ngoorabul people who currently work three days a week on the properties.

Working back on country is important to the local people. It brings back responsibility, pride, social and economic balance to them, their families and the wider community, and provides for a better environment for all.

Jidaanga cultural project, New South Wales—the endangered orchid *Phaius australis*

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Introduction

The local Guri community, Booroongen Djugun College, the NSW Department of Environment Climate Change and Water (the Department) and the Northern Rivers Catchment Management Authority (the Authority) have banded together to save an endangered orchid from extinction.

Through the encouragement of a distinguished Elder of the Dunghutti–Gumbaynggir nations, the late Aunty Maggie Morris, the Natural Resources Unit of Booroongen Djugun College located a small colony (17 plants) of *Phaius australis,* also known as the Swamp Orchid or Swamp Lily, in the Kempsey area on the mid north coast of New South Wales. The Department believe this newly located colony to be the southern limit of the Swamp Orchid, the next nearest colony being near Coffs Harbour approximately 100 km to the north.

Much of the information regarding the Swamp Orchid in its natural setting is local knowledge held by Aboriginal people in the community. There is limited written or published research but a wealth of verbal Traditional knowledge held by the Aboriginal communities.

Phaius australis recovery project

Booroongen Djugun College formed an Aboriginal Natural Resource Agreement with the Department's Northern Country Culture and Heritage Division, Scientific Branch and Biodiversity Assessment and Conservation Section. With a Northern Country Culture and Heritage Division grant of $25 000, the College established the *Phaius australis* recovery project.

As part of the program two plants were removed under a Departmental licence to be kept at separate locations as an insurance measure in case of the loss of the natural plants. Gary Morris, the Chief Executive Officer of Booroongen Djugun College, said that custodianship of these plants helps ensure there is genetic backup for the *in situ* population of 17 plants which are at risk for a variety of reasons.

The *ex situ* plants have been successfully nurtured and one plant flowered in the spring of 2010. The other plant was pollinated, and the seed collected and delivered to two laboratories for safe keeping.

A weed management team selected by the local Aboriginal community have worked at the site after receiving accredited training in Conservation and Land Management through Booroongen Djugun College. The existing Swamp Orchid population has been cleared of feral weeds which were overgrowing and shading out plants. The remaining Swamp Orchids are more vigorous and healthy and in three flowering seasons have gone from one flowering spike for the colony to five spikes, of which two set and dispersed seed.

The late Aunty Maggie Morris, a distinguished Elder of the Dunghutti–Gumbaynggir nations, whose encouragement lead to the Jidaanga cultural project.
Photo: courtesy of Garry Morris.

Phaius australis*, the Swamp Orchid or Swamp Lily, in flower.*
Photo: Ray Clements.

Cultural Heritage officers from the Department's Northern Country Culture and Heritage Division trained the team in cultural site surveying methodology. Hilton Naden, the Division's Manager, said that by reconnecting the cultural renewal aspects, it will be possible to explore the shared coexistence between the *Phaius* and cultural values within the local area and the traditional uses of the Swamp Orchid. The project methodology is innovative in that it consistently involves the ecological expertise and advice of the Traditional Owners, Aboriginal Elders and knowledge holders.

Ongoing management

Booroongen Djugun College was successful in obtaining a NSW Government Environmental Trust 'Restoration and Rehabilitation' community grant of close to $100 000 to develop and implement a Translocation and Management Plan.

The *Phaius australis* Recovery—Increasing Native Habitat project was recently renamed 'Jidaanga Cultural Project—Endangered *Phaius australis*'. Jidaanga is a Gumbaynggir word meaning waterhole. The new name was in honour of Aunty Maggie, a recipient of an award from Andrew Refshauge MP, Deputy Premier, in 2002 in recognition of her outstanding contribution to heritage and conservation in New South Wales.

The Jidaanga Cultural Project aims to:

- obtain 1500 plants from culture and seed growing to a size where there is a reasonable chance of survival and reintroduction to a suitable habitat
- develop and implement a Translocation and Management Plan to identify suitable habitat where there is a likelihood of successful reintroduction

- integrate the Traditional ecological knowledge of the Dunghutti and Gumbaynggir peoples with the orthodox scientific skills of the Department in training Aboriginal participants to create a geographic information system
- provide further training opportunities for Aboriginal communities in conservation and land management, incorporating the management actions for on-ground works on 'country'.

Conclusion

The future of the Swamp Orchid is precarious, and it is listed as an endangered species under both Commonwealth and State legislation. There are currently about 14 known populations in New South Wales, most of which have very few plants. The cause of this decline was originally from land clearing by way of logging, feral pigs, pasture creation, sand mining and now, in its rarity, illegal collection. We seem to be powerless to stop land clearing.

Broad-leaved Paperbark (*Melaleuca quinquenervia*) swamps near the coast usually (but not exclusively) seem to be the main habitat for the Swamp Orchid. For the orchid's future survival in the wild it is therefore essential that these paperbark swamps are also preserved and not degraded.

Through the collaborative efforts of our partners and the Dunghutti and Gumbaynggir Elders, this work intends to acknowledge the Aboriginal contribution and importance of saving a very important part of our cultural heritage.

Saltmarsh restoration: success story with future benefits for many partners

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Background

The Fingal Peninsula is a barrier spit which forms the southern side of the mouth of the Tweed River (Figure 1). The peninsula's estuarine communities include mangroves, salt marsh and coastal vegetation. Sponsors Lagoon, which is a central feature of the peninsula, was sand mined in the early 1960s. The salt marsh behind the mangroves was intact apart from surface erosion caused by recreational vehicles driving on it over many decades. Many stolen cars were bogged and subsequently left on the salt marsh to rust. The disturbance and planting of exotic species after sand mining led to the colonisation of non-local weed species especially Bitou Bush *(Chrysanthemoides monilifera* subsp. *rotundata)* in higher areas around the salt marsh. The dominant salt marsh vegetation species were Saltwater Couch (*Sporobolus virginicus*), Suaeda (*Suaeda australis*), Sarcocornia (*Sarcocornia quinqueflora* subsp. *quinqueflora*) and Sea Rush (*Juncus kraussii* subsp. *australiensis*).

The mangroves around Sponsors Lagoon provide habitat for the Mangrove Honeyeater (*Lichenostomas fasciogularis*), a vulnerable species (Schedule 2, *Threatened Species Conservation Act 1995*). Members of the Tweed Byron Local Aboriginal Land Council reported that Whimbrel (*Numenius phaeopus*) and Ibis (*Threskiornis* sp.) were commonly encountered on the site.

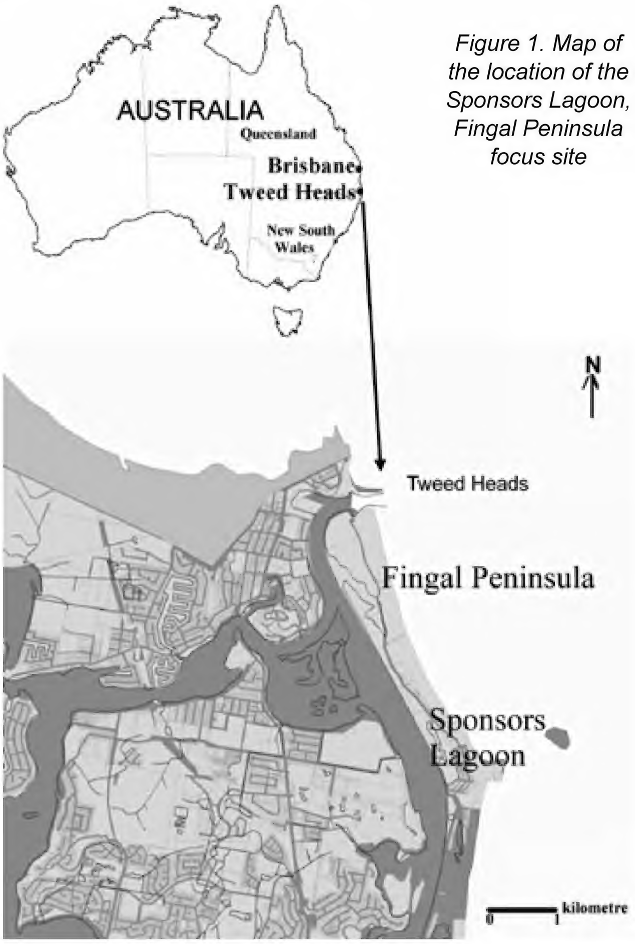

Figure 1. Map of the location of the Sponsors Lagoon, Fingal Peninsula focus site

Project development

In early 2003, the Tweed Shire Council's Tweed River Committee and the Aboriginal landowners of the Fingal Peninsula, the Tweed Byron Local Aboriginal Land Council (the Aboriginal Land Council) met to formally address the ongoing degradation of the Fingal Peninsula estuarine wetlands. Later that year, the non-government organisation Wetland Care Australia assisted in the formation of a partnership under the Fish Unlimited Program (funded by the Federal Government through the Sustainable Regions Program). Under this program the Fingal Wetland Conservation Project became a reality.

The aim of the project was to reverse the degradation in and around Sponsors Lagoon through a staged restoration program. The primary objectives were to prevent vehicle access and further site disturbance, and to rebuild the salt marsh vegetation community (Figure 2). Salt marsh was the focus of the project due to the increasing recognition of the scarcity of this habitat type in the Tweed Estuary. All stakeholders agreed that these goals were achievable. A research program was then initiated to measure the 'success' of the salt marsh vegetation restoration.

The project team comprised the Aboriginal Land Council work team, Tweed Shire Council officers, the Wetland Care Australia project manager, the research person and an independent site works assessor. On-ground works followed the action plan developed by the project team (see Geolink 2003).

Project works

The first task was to remove all car bodies and rubbish and attempt to prevent future vehicle access. Sponsors Lagoon was secured from four-wheel vehicle incursions but some access by trail bikes continued. At first there was evidence of continual attempts to gain access through gates but this diminished over time with continual monitoring by the Aboriginal Land Council.

On-ground works were undertaken by the Aboriginal Land Council Wetland Conservation Team members. The activities provided them with training in bush regeneration, skills in managing a restoration project, planning, preparation of grant applications and record keeping. The Aboriginal Land Council provided tools for the works, a site compound to house equipment, a nursery, a vehicle, administrative services for the work team and ongoing care and management after works were completed. This commitment by all stakeholders ensured successful completion of the on-ground activities.

To reinstate the appropriate elevation of the Sponsors Lagoon substrate for it to be suitable for salt marsh, the patches of remnant salt marsh were connected through filling with sand from a dune adjacent to the site (Figure 3). After filling, the rehabilitated surface was allowed to consolidate over one week and then refilled to required levels if needed.

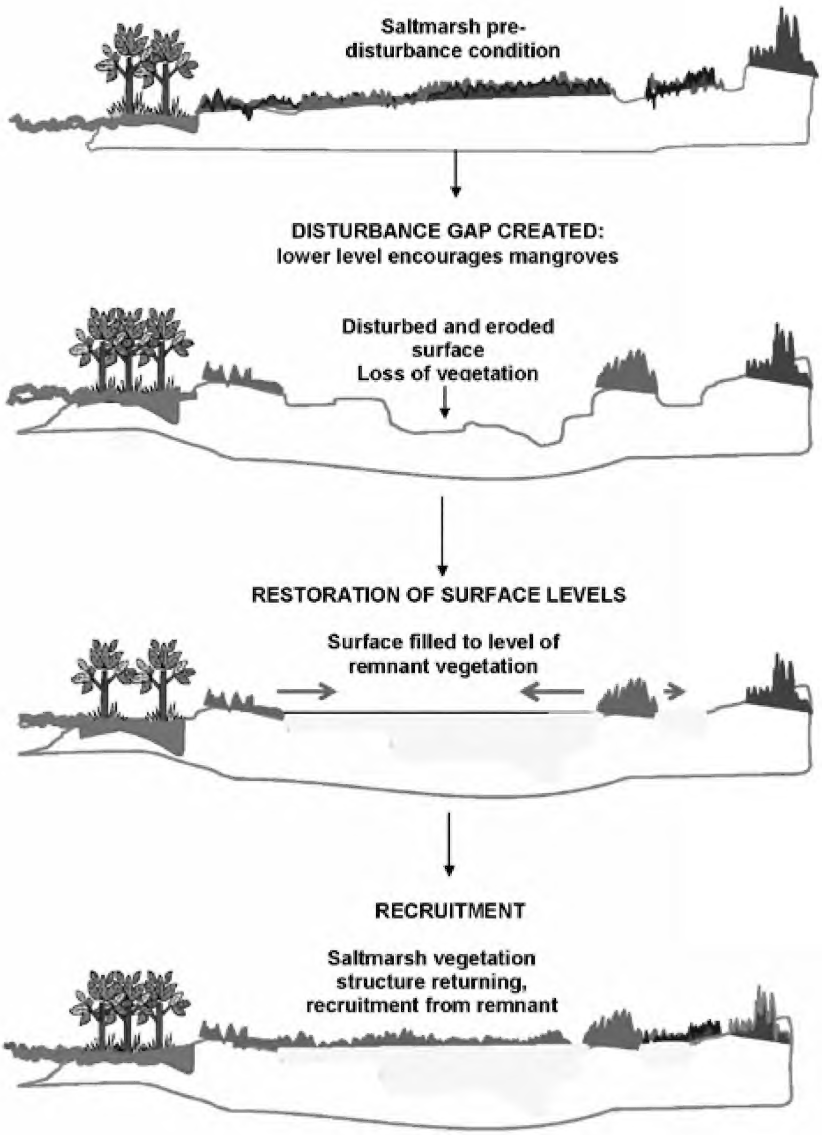
Saltmarsh pre-disturbance condition
DISTURBANCE GAP CREATED:
lower level encourages mangroves
Disturbed and eroded surface
Loss of vegetation
RESTORATION OF SURFACE LEVELS
Surface filled to level of remnant vegetation
RECRUITMENT
Saltmarsh vegetation structure returning, recruitment from remnant

Figure 2. Conceptual diagram of restoration of salt marsh after vehicle damage to the soil surface. After soil levels are re-built, the gap without vegetation is colonised by fast-growing seed germinated species such as Suaeda australis *and* Sarcocornia quinqueflora*. Over time the slower establishing* Sporobolus virginicus *covers the ground. Colonisation of salt marsh species is related to tidal inundation levels.*

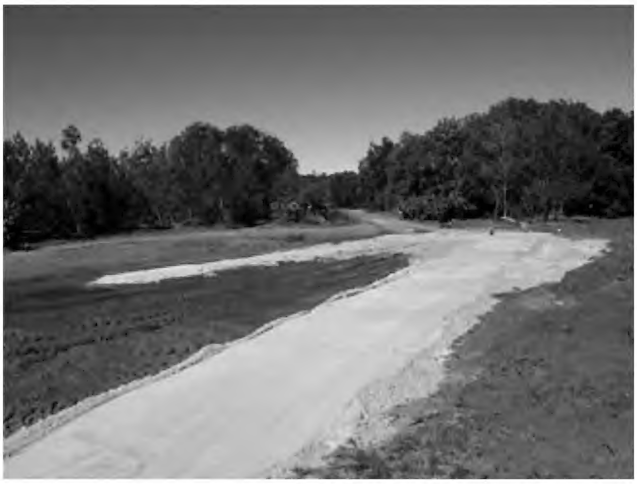

Figure 3. Fill material being added to the eroded sites. Photo: T. Alletson

Individual sods of turf (turves) of *Sporobolus virginicus* were selected and cut from intact salt marsh adjacent to the site. The Aboriginal Land Council wetland conservation team developed the pattern and equipment for restoration planting. Systematic layout was achieved using successive quadrats defined by a PVC conduit square (1 m x 1 m) placed on the soil surface. Planting was at low tide using one 10 cm x 10 cm turve per quadrat. Donor material was translocated using guidelines provided by previous studies of *S. virginicus* (Laegdsgaard 2002). Further details of the techniques used are in Geolink (2003).

Outline and results of the research program

An experimental design to measure ecological restoration success was incorporated into the on-ground works planning at Sponsors Lagoon. Salt marsh restoration sites (planted and non-planted) were compared with nearby disturbed (control) and reference sites. Variables measured over three years following the works included per cent soil moisture, pH, electrical conductivity, Total Organic Carbon, Total Nitrogen, soil algal abundance (chlorophyll *a*), diatom abundances, and flora and fauna colonisation.

The measurements of chlorophyll *a* showed that the restoration sites were progressing towards, but were not equivalent to, the reference state in the first two years after restoration (2006), despite the fast growth rates of soil algae. Analyses of across-site variables and chlorophyll *a* over time showed that solar radiation, rainfall and tidal inundation were influential to the soil stabilising microalgal growth.

Changes in the vegetation cover three years after soil reconstruction work (2007) showed that the dominant Saltwater Couch established only from vegetative growth arising from remnant vegetation, but there was strong seedling regeneration of Suaeda and Sarcocornia. It was concluded that planting is important where the resilience of the individual species is lower and natural regeneration potential is limited (Green *et al*. 2009).

Conclusion

In early 2011 the restoration areas are indistinguishable from the original remnant saltmarsh with a full cover of saltcouch following the original objectives (Figure 4). The Fingal Conservation Project has provided important information that will help ensure that future salt marsh restoration projects are successful, and financial commitments by government and stakeholders provide scientifically sound conservation management outcomes. The project also provided members of the Aboriginal landowners of the Fingal Peninsula with a range of skills relevant to ongoing plant conservation in the area.

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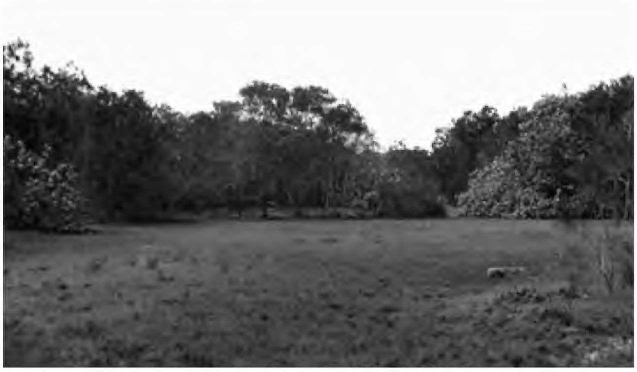

Figure 4. Sponsors Lagoon saltmarsh in 2011. Photo: J. Green

Indigenous-driven tropical ethnobotany

Rosemary Hill[1], Gerry Turpin[2], Warren Canendo[3], Peta-Marie Standley[4], Darren Crayn[5], Sarah-Jane Warne[6], Katrina Keith[6], Eda Addicott[5] and Frank Zich[5]

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[5]Australian Tropical Herbarium, Cairns.
[6]James Cook University's Cairns Institute, Cairns.

Indigenous knowledge is recognised globally for its potential value in contemporary biodiversity conservation, management and research (Convention on Biological Diversity 2010; NRMMC 2010). In tropical Australia, Indigenous peoples' strong and diverse presence on country presents an important opportunity to support Indigenous knowledge and management systems. In November 2010, we held a workshop in Cairns to consider whether a tropical Indigenous ethnobotany centre would be a good way of supporting Indigenous peoples' knowledge about the cultural values of plants.

Ethnobotany workshop

The workshop was initiated by Mr Gerry Turpin (Figure 1), an Indigenous man and Mbabaram Traditional Owner who works as an ethnobotanist with the Australian Tropical Herbarium, a joint venture between James Cook University, CSIRO and the Queensland Department of Environment and Resource Management, based in Cairns. Gerry saw potential mutual benefits to Traditional Owners, research organisations, and to the conservation of plants and plant knowledge from the establishment of an ethnobotany centre. There is currently no such centre in Australia dedicated to Indigenous Australian knowledge of plants.

Figure 1. Mbabaram Traditional Owner, Australian Tropical Herbarium and Queensland Herbarium Ethnobotanist Gerry Turpin in the field. Photo: Mark Newton; copyright Department of Environment and Resource Management.

Traditional Owners from across the wet tropics bioregion and Cape York Peninsula attended the workshop, together with scientists, herbarium specialists and policy-makers interested in ethnobotany from geographic locations across south-east Queensland, the Northern Territory and the Australian Capital Territory. We were inspired by some of the dynamic approaches to conserving cultural knowledge of plants that Traditional Owners are developing, including digital video data-bases with recordings of senior Elders talking on country. Traditional Owners from Cape York Peninsula were also excited to see the plant specimens collected on their traditional country by Joseph Banks near Cooktown while the *Endeavour* was being repaired, which are among the most prized collections of the Australian Tropical Herbarium (Figure 2). A sense of the potential power of bringing these two knowledge systems together gave the workshop a hum of excitement.

Future Indigenous-driven ethnobotany partnerships

Participants identified that establishment of an ethnobotany 'centre' could be a valuable means of supporting Traditional Owners in the conservation, management and communication of their ethnobotanical knowledge. The concept of a centre was very much of one driven through Indigenous partnerships, with a network structure. We all agreed that its name needs to capture this concept, perhaps through use of an Aboriginal word.

An ethnobotany partnership centre could enable Indigenous communities across the North to access resources for, knowledge of, and skills in contemporary botanical practices. In order to provide these benefits, Traditional Owners at the workshop identified that the ethnobotanical network should be:

1. Indigenous-driven and based on respect for Indigenous knowledge, law and culture;

2. based on Indigenous governance and protocols;
3. a leader in the protection of Indigenous intellectual property and recognition of Indigenous knowledge-holders;
4. linked to sustainable economic development, education and training;
5. started by pilot partnership projects initiated by Traditional Owners; and
6. supported by an effective communication strategy.

Progressing the concept

At the conclusion of the workshop, an Indigenous Working Group, comprising people with interest, knowledge and skills in ethnobotany, was formed to progress an Indigenous-driven ethnobotany centre in partnership with the Australian Tropical Herbarium, CSIRO, and the James Cook University's Cairns Institute (the Institute). Workshop participants expressed a genuine interest in being pro-active and taking responsibility for the on-going development of an Indigenous-driven ethnobotany partnership model. By applying an Indigenous-driven methodology the centre could potentially demonstrate best-practice models and stimulate culturally appropriate partnerships for knowledge generation and sharing nationally and internationally.

The coordinating committee of people from the Australian Tropical Herbarium, CSIRO and the Institute who organised the workshop are currently finalising a workshop report. We are seeking funds to support the Indigenous Working Group, and exploring some pilot projects, building on ethnobotany projects that are already underway. The report, when finalised, will be used to assist participants in informing their Traditional Owner communities about the ethnobotany centre idea, and seek wider institutional support and long-term commitment to the development and establishment of an Indigenous-driven ethnobotany centre in the tropics.

Conclusion

The workshop facilitated the sharing of information and the building of relationships and networks between participants. We are looking forward to this stimulating ongoing support for Indigenous-driven ethnobotany.

Acknowledgements

We would like to thank the Traditional Owners, Australian Tropical Herbarium, Marine and Tropical Science Research Facility, CSIRO's Building Resilient Australian Biodiversity Assets Theme, James Cook University's Cairns Institute, Queensland Herbarium and the Tropical Landscapes Joint Venture for their invaluable financial and in-kind support to this initiative.

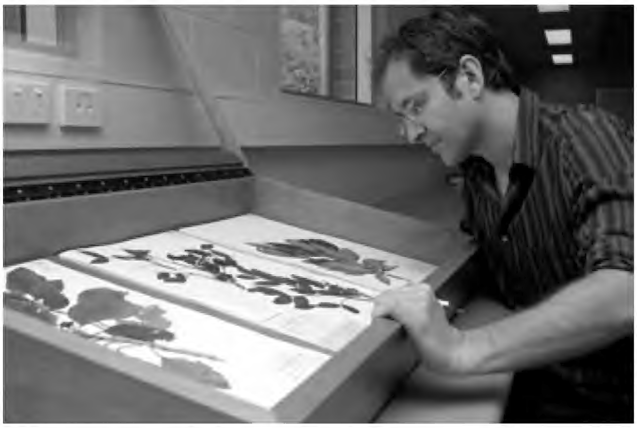

Figure 2. Australian Tropical Herbarium Director Darren Crayn with one of the Banks specimens collected on Captain Cook's voyage in 1770. Photo: Sue Wellwood; copyright James Cook University.

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Managing fire and measuring progress in the Arafura Swamp Region: applying adaptive fire management to maintain and enhance natural, cultural and social values workshop

Published by the North Australian Indigenous Land and Sea Management Alliance (NAILSMA), 2010.

This report summarises a planning and information sharing workshop held at Ngaliyindi Outstation, Arnhem Land, 20–25 September 2010, hosted by Gurruwiling rangers, south-east Arafura Rangers and the people of Ngaliyindi.

As part of ongoing development of economically, ecologically and culturally sustainable land management projects for remote Indigenous communities across the fire prone savannas of northern Australia, the primary purpose of this workshop was to bring senior Aboriginal people from around the Arafura Swamp region together with scientists and local rangers to discuss land management planning for the region.

The workshop focused particularly on fire management and related issues (fire-sensitive biota, traditional ecological knowledge), and reaching better understanding for the need to implement strategic fire management, economic opportunities for achieving land management outcomes, and useful ways for monitoring progress especially with respect to core cultural, social and biodiversity values. The workshop involved a mix of site visits, hands-on monitoring techniques and semi-structured workshops.

The report shows the level of activity and interaction between Traditional Owners and scientists in the Arafura Swamp Region, and highlights biodiversity outcomes of the workshop program including the condition of rainforests and the condition of Cypress Pine stands. One outcome of the workshop was for more of these types of meetings involving Traditional Owners, scientists and landowners to be held in the future, to share knowledge and in part help ensure effective fire management, especially in areas with significant biodiversity values.

The report is available on-line. We have not included the url, as it is about seven lines long, but the report can easily be found by searching on ‘Managing fire and measuring progress in the Arafura Swamp Region’.

A renewed Global Strategy for Plant Conservation and other COP10 outcomes

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The 10th Conference of the Parties (COP10) to the Convention on Biological Diversity (the Convention) took place from 19–29 October, 2010 in Nagoya, Japan, and involved 193 countries. Botanic Gardens Conservation International (BGCI) and other members of the global botanical community were in attendance to ensure that the Global Strategy for Plant Conservation (the Global Strategy) was successfully renewed and strengthened for work from 2011 to 2020. Many outcomes of the COP10 are directly related to plant conservation efforts, ranging from the adoption of an updated Global Strategy and the new Nagoya Protocol on access and benefit sharing, to the launch of a number of useful reports. This article provides a summary of key plant conservation outcomes and resources following COP10.

Updating the Global Strategy for Plant Conservation

Adopted by the parties to the Convention in 2002, the original Global Strategy outlined guiding principles and 16 outcome-oriented targets for global plant conservation actions to 2010 (see www.cbd.int/gspc/). After 2002, governments and partner organisations around the world worked in a range of capacities to achieve the targets. In 2010, BGCI and other organisations worked to assess work toward these targets, identifying significant progress but also substantial gaps in achieving most. Following a global consultation, the 16 targets were updated for work from 2011 to 2020, and these updates were put forward at COP10.

Suzanne Sharrock, BGCI's Director of Global Programmes, speaking in support of the Global Strategy for Plant Conservation in Nagoya, Japan. Photo: Andrea Kramer.

Happily, governments from around the world voiced overwhelming support for the updated Global Strategy. Many countries highlighted the progress made as a result of adopting the original plant conservation strategy in 2002 (for example, the *First Asian Plant Conservation Report*; Keping *et al*. 2010). A number of countries also highlighted the need for increased resources to be devoted to plant conservation in order to meet the ambitious 2020 targets. While the latter were approved with relative ease by the COP10 delegates, financial support unfortunately remains a critical issue in their implementation. This means it is more important than ever to make a strong case for increased support of plant conservation at the local, national, and global level (see final section below) while maintaining an innovative and collaborative approach that makes the most of limited resources.

BGCI is now developing an online Global Strategy toolkit, and working with the botanical community around the world to support its successful implementation. Progress toward this will be reviewed in 2015, and with everyone's help we'll ensure governments engage in and support plant conservation to achieve the Global Strategy targets by 2020.

Ex situ conservation target

The updated Global Strategy recognises that *ex situ* conservation is an important insurance policy in times of global change. It also emphasises the need for such collections to be genetically representative and easily accessible. Among the Global Strategy's 16 targets is Target 8, which aims to have *75% of threatened plant species in accessible* ex situ *collections, preferably in the country of origin, and 20% of them included in recovery and restoration programs* by 2020. BGCI is a facilitating agency for the global implementation of this target, and maintains the online PlantSearch database to enable global tracking of progress on it (for living and seed bank collections, see www.bgci.org/plant_search.php).

Using the data in PlantSearch, BGCI recently published European, North American, and global assessment reports summarising progress toward Target 8. These reports identified 42% of 1917 threatened European plants in Europe's *ex situ* collections (Sharrock & Jones 2009), 39% of 9496 threatened North American plants in North America's *ex situ* collections (Kramer *et al.* 2011), and 23% of some 40 000 globally threatened species in global *ex situ* collections (Sharrock *et al*. 2010). In Australia, reports of successful *ex situ* conservation activities through government agencies, botanic gardens, and other conservation partnerships and organisations such as ANPC suggest that, at the continent-level, Australia has made great progress in achieving Target 8. North (2009) indicated that one-third of 8000 threatened Australian taxa would be in seed banks by the end of 2009. Over the coming decade it will be important to continue expanding this capacity to provide a safety net for the world's threatened plants.

Nagoya Protocol on access and benefit sharing

The ultimate success of COP10 relied largely on the ability of governments to agree on a formal *access and benefit sharing* protocol, and complex negotiations on this subject were carried out around-the-clock. On many days it seemed unlikely that an agreement would be reached, but at the end of the last plenary session on the last day, compromise text was ultimately adopted. The agreed-on text (see www.cbd.int/abs/about/) is now known as the *Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity.*

The Protocol aims to provide legal certainty to users and providers of genetic resources and associated traditional knowledge, establishing a framework to regulate access and benefit sharing at the national level. While criticised for being too ambiguous and generalised, the Nagoya Protocol represents an important step in the implementation of the Convention. This Protocol will enter into force 90 days after the 50th country has ratified it, which will likely not happen before COP11, to be held in India in October 2012. Stay tuned for more information about how this new Protocol, once entered into force, may affect plant conservation work.

The Economics of Ecosystems and Biodiversity

Another major event at COP10 was the launch of reports on The Economics of Ecosystems and Biodiversity, designed to make sure the world's natural assets are more effectively included in global political discussions. These reports were the result of a two-year study drawing on expertise from around the world to quantify the costs of biodiversity loss and associated declines in ecosystem services.

The reports compare the economic costs of biodiversity losses with the cost of effective conservation and sustainable use. The intent of this was mainstreaming the economics of nature and increasing awareness of the true cost of biodiversity loss, in order to develop more effective policy that incorporates costs appropriately. Rather than just producing a stand-alone scientific report, distilled reports were produced for policy makers, business, and for citizens (see http://www.teebweb.org and http://bankofnaturalcapital.com). This information should prove useful in efforts to justify increased financial support for plant conservation.

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ANPC in the USA: directions in science and conservation at the Smithsonian Institution

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A long fall, punkin-chunkin and the search for the Stinking Yew

Last autumn was like a lovely long afternoon. After a relatively hot and dry 2010 summer in north-eastern North America, we were treated to a beautiful extended fall season, with foliage in vibrant arrays of reds and yellows that fluoresced in the warm afternoon sun.

Many southerners enjoy an annual tradition of driving north to Vermont where the foliage colours are at their peak in early October. Our lab group decided instead to extend our summer by heading south to Florida through seven states in south-eastern North America, past blooming cotton fields speckled with tiny clouds of fluff, 14-lane freeways in Atlanta, and the beautiful mountains of North Carolina. Our goal was to collect root samples of the Stinking Yew (*Torreya taxifolia*), an endangered evergreen conifer tree that has recently become a victim of a mysterious fungal infection. To our bodies' chagrin, the species grows on steep inclines in humid jungles, although the workout was great after all the wonderful deep-fried southern food. Thankfully we were back just in time for the annual 'Punkin Chunkin' festival, where people make good use of the many carved and decorated pumpkins left over after Halloween by catapulting their ghoulish faces into the sky.

Inspiration from fan mail

I was recently asked to give a presentation about my research to a Grade 3 class. While not my usual audience demographic, I found the class extremely attentive and inquisitive—particularly on the topic of whether I'd met the Crocodile Hunter. A week later I received a bundle of letters that included accurate descriptions of orchid pollination mechanisms and a desire to learn more about botany. The enthusiasm in the letters made me realise that reaching out to the community about science can make a difference.

Science and conservation highlights

Amend *et al.* (2010) undertook a global survey of fungal diversity, showing that while fungal diversity is higher in temperate regions than the tropics (contrasting with common ecological patterns), building architecture and material structure did not influence indoor fungal composition. Since you can't hide from fungi in your house, I have developed a collection of sourdough cultures for bread-making. As a fungal biologist I can't help babying them, carefully feeding them daily and placing them by the heater at night, obsessively watching their bubbly growth process. The yogurt and white flour culture is the best so far.

Success of 249 plant species reintroductions was recently assessed by Godefroid *et al*. (2010), showing low overall survival (less than 52%). The work was limited by factors such as insufficient post-reintroduction monitoring and documentation of results, and the authors suggested improvements to reintroduction as a conservation tool including improved knowledge of species biology.

Robbirt *et al*. (2010) have shown that herbarium specimens contain valuable information about species biology and natural cycles, revealing that the flowering time for early spider orchids (*Ophrys sphegodes*) is six days earlier for every 1ºC (1.8ºF) increase in the average spring temperature. Lindenmayer and Hunter (2010) provide some guiding concepts and strategies to improve conservation outcomes.

It appears that land plants have been around longer than we thought. Rubinstein *et al*. (2010) showed that plants first colonized land up to 10 million years earlier than previously thought (up to 472 million years ago), with the discovery of liverwort spores in Argentinian sediments.

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Research Roundup

Compiled by Kirsten Cowley, Centre for Plant Biodiversity Research, Canberra. Email: Kirsten.Cowley @csiro.au

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Contributions to Research Roundup are welcome, and should be sent to Kirsten Cowley at the above email address using an email subject heading "APC Research Roundup" or similar. Their inclusion will be subject to available space.

Book Reviews

Mistletoes of Southern Australia

by David M. Watson
Publisher: CSIRO Publishing, Collingwood, Victoria, February 2011
200 pages, colour paintings, colour photographs
Paperback, ISBN: 9780643095939. Price: AU $49.95
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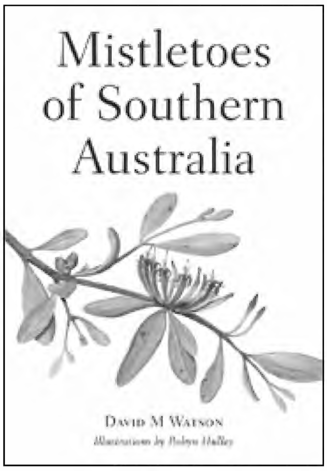
Mistletoes of Southern Australia
David M Watson
Illustrations by Robyn Hulley

There are probably few groups of plants anywhere in the world which stimulate our curiosity and interest more than do the mistletoes. Mistletoes thus provide fertile ground not only for scientific research but also for popular treatises, exploring their parasitic habit, their interactions with bird pollinators and seed dispersers, their interactions with their hosts, their insect friends and foes, their dispersal and geographic distributions, not to mention their prominent place in mythology, legend and folk medicine.

This book by David Watson deals with all of these issues in a readable and well-researched way, reflecting his long interest in these plants in southern Australia. The book also includes descriptions and illustrations of all mistletoes occurring in the southern states and the southern part of Western Australia south of 26°S latitude.

The introductory chapter provides a definition of a mistletoe, how its parasitic haustorium functions, a summary of the mistletoe plant families and their geography, and their representation in Australia. Following this introduction, descriptions and illustrations are provided for the 46 species which occur in the defined area. These include a common name (sometimes coined by the author), geographic distribution, a description which minimises use of technical terms, and notes including habitat, hosts and butterfly associates.

The general chapters deal with numerous aspects of mistletoe biology, and are very readable, comprehensive, and widely researched. Topics include mistletoes' effects on the host, mistletoes on mistletoes (epiparasitism), host range, role of birds in seed dispersal, mistletoes as food plants for possums and butterflies, flowering seasons, host mimicry, and mistletoes as shelter plants and contributors to litter quality. All these aspects lead to an argument on the role of mistletoes as keystone species in natural communities.

There is a chapter on cultural values, dealing very briefly with the traditional European beliefs and ceremonies but treating in full detail the relatively limited information on Indigenous knowledge of mistletoes in Australia, and their uses as medicine and food.

The final section on management presents a detailed account of the history of changes in mistletoe abundance and attitudes to these changes, the roles of bushfire and drought, summarised in the effects of changes in land use on mistletoe abundance. Strategies for mistletoe control (herbicides, possum introduction, controlled burning) are outlined. Finally there is a section arguing (perhaps controversially) for the conservation of mistletoes as keystone species in integrated land management, even to introducing them into plantations. The text is relatively free of grammatical errors.

The simplification of the botanical language in the species descriptions is commendable, but possibly a little overdone. For example, broad use of the term 'stems' to include leaf stalks (petioles) and inflorescence axes or flower stalks (peduncles, pedicels) may be confusing to the reader. On pages 14 and 15 there is confusion between the term hypocotyl and the holdfast. The 'showy' mistletoes, incidentally, are not all showy, some non-Australian genera having very small, inconspicuous flowers. In comparison with the 'true' mistletoes (Viscaceae) neither are they all bisexual (hermaphrodite) (p. 124), with some non-Australian species having unisexual flowers (notably in the genus *Loranthus* itself!).

It is doubtful whether the use of common names for mistletoe species throughout the general text has any real advantage. When a reader has to check back to a list to associate a name with a species and its general features, at least the botanical names are in alphabetical order and easily located.

Each species treated in the book is illustrated by a painting by Robyn Hulley. The paintings complement the species descriptions as a useful aid to identification. Technically, however, they fail to meet the normal criteria for classification as botanical illustrations. There are numerous errors of detail, especially with respect to the structure of the inflorescences (flower clusters), and even in some cases with respect to simpler details such as leaf arrangement.

In the species accounts and the summary list at the end of the book, the author has omitted or overlooked the occurrence of several Australian mistletoes beyond Australia over and above those he has noted. These include *Amyema miraculosa*, *A. queenslandica*, *Decaisnina congesta*,

Book Reviews (cont.)

D. hollrungii, *Dendrophthoe glabrescens*, *D. odontocalyx*, *Korthalsella japonica* and *Viscum ovalifolium*. Whilst this has little relevance to the mistletoes of southern Australia, it does have bearing on the discussion of mistletoe dispersibility. The total picture appears to show not only intruder mistletoes arriving in Australia, but also 'Australian' mistletoes reaching Indonesia as well as New Guinea, or perhaps the former geographic extent of some of our mistletoe species at times of lowered sea level.

Host range (specificity) also needs careful analysis. For example, to describe a species recorded from 110 host species of eucalypts as having the widest host range detracts from the fact that the species is highly specific for eucalypts as hosts. Incidentally, host records taken from old herbarium specimens can be misleading, as they frequently include misidentification of the host by the collector, and often quote the ultimate host when a mistletoe is actually epiparasitic on another.

The author presents a number of apparently original ideas in the book, sometimes almost as fact. Some of these could be primers for future research, although it isn't always clear whether or not they are based on any current knowledge, or whether they are consistent with the mainstream scientific research. Nevertheless such ideas are a primary source of all such research, and illustrate the author's very broad knowledge and reading on the subject.

This book is excellent for those who are interested in identifying mistletoes in southern Australia, and placing them in a background of evolution, migration, interaction and management.

Bryan Barlow, retired mistletoe researcher, Canberra.

Floodplain Wetland Biota in the Murray-Darling Basin: Water and Habitat Requirements

Edited by Kerrylee Rogers and Timothy J. Ralph
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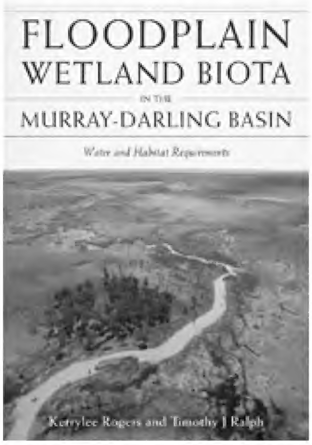

FLOODPLAIN WETLAND BIOTA
IN THE
MURRAY-DARLING BASIN
Water and Habitat Requirements
Kerrylee Rogers and Timothy J Ralph

As stated in the preface of this much awaited book, the Murray-Darling Basin (the Basin) is one of the largest inland drainage basins in Australia, which also encompasses around 1.061 million square kilometres of prime agricultural land. The slopes and plains of the Basin support a range of ecosystems, including more than 30 000 wetlands (i.e. areas that are permanently or temporarily covered by fresh, brackish or saline water). Of these, 15 are recognised for their international significance under the Ramsar Convention with many more listed as Wetlands of National Importance in Australia. There are 17 large and complex floodplain wetland systems recognised, the majority in New South Wales, and each is associated with relatively large perennial or intermittent rivers. These wetlands are characterised by a variety of hydrological, geomorphological and ecological features and all perform a significant ecological role in the provision of critical aquatic habitat and other ecosystem services.

The book, which has been meticulously researched by the authors and their contributing colleagues, provides a focus on inland *floodplain wetlands* that occur on low-lying, depositional areas of floodplains and are reliant on a supply of freshwater from inland rivers and creeks. The authors define floodplain wetland as the collection of landscape and ecological components subject to inundation around a river, which may incorporate a range of wetland types. In the Basin this includes freshwater and saline wetlands: lagoons and lakes, marshes, distributary channels, anabranches, billabongs, overflows, swamps and water holes, along with the riparian forests, woodlands and grasslands that intersperse them. The floodplain wetlands of the Basin provide critical habitat and energy sources, and support abundant flood-reliant and flood-tolerant biota. The latter is particularly evident following a flood when a wetland becomes alive with wildlife and flush with new vegetative growth.

However, as reported by the authors, the ecology of the Basin's floodplain wetlands is threatened by a range of environmental issues. Of primary importance is water regulation within the Basin, which has resulted in an increased predictability and consistency of river flows to floodplain wetlands, and is implicated in the decline of these environmental assets. These ecosystems originally evolved under a regime of hydrological variability (and often unpredictability). The impacts of water regulation and water resource management are further exacerbated by the trends and uncertainties now recognised due to a changing climate. Global warming is expected to cause

Book Reviews (cont.)

an overall decline in surface water availability across the Basin in the 21st century and flood regime changes are projected to continue.

This new addition to the aquatic ecology lexicon represents a unique collection and synthesis of information on the water requirements of flora and fauna (biota) across the broader geographical and ecological range of the Basin, including for lesser reported non-iconic taxonomic groups such as invertebrates and amphibians, or the shrub lignum. As stated by the primary authors, the main purpose of the book is to provide a synthesis of information about the water requirements of biota, to provide a baseline for further education and research, and to better inform environmental managers who work with water allocations in floodplain wetlands of the Basin.

Various chapters of the book present profiles of the water requirements of selected species, based on data from the biological and ecological literature for the species' geographic range. The book also highlights the ecohydrological knowledge gaps for some species. Species were selected on the basis of their occurrence within floodplain wetlands of the Basin, and the availability of relevant literature. In this first volume the biota is divided into five focus groups: vegetation, waterbirds, fish, frogs, and crustaceans and molluscs. Information is provided on the influence of the water regime (e.g. flood frequency, duration, depth, timing, return period, rate of rise and fall of floodwaters etc.) on species survival, health and condition. Biotic factors associated with species performance and flooding have also been incorporated, such as germination timing, and triggers for reproduction and development, in addition to habitat and dietary needs and trophic level.

Chapter 1 considers the geographic context of the Basin's floodplain wetlands as well as the ecological responses of their biota to flooding. It explains how these ecosystems are naturally variable and are characterised by complex interrelationships between their flood patterns, landforms and soils, and ecological communities. Key geographic, climatic, hydrological, geomorphological and ecological variability is summarised.

Chapters 2 to 6 provide profiles of the water requirements of individual species of the Basin's floodplain wetland biota that occur for the five focus biota groups. They include consideration of aspects crucial for the survival, maintenance, reproduction and regeneration of 35 key vegetation species, 48 waterbird species, 17 native and four alien fish species, 15 key frog species and 16 species of crustaceans or molluscs. There is a very detailed and useful summary table of the water requirements for the maintenance and survival of selected plant species in the Basin, which includes a range of metrics on ideal flood conditions (e.g. frequency, duration, maxima, timing depth, inter-flood dry period etc).

Chapters 7 and 8 provide an overview of the impacts of hydrological (and geomorphic) change on biota (particularly the projected decline in surface water availability) and the implications of hydrological change for the management of biota, including the need to constantly re-evaluate and re-set ecological objectives and manage social expectations. The author stresses that the challenge posed by altered hydrological regimes is to manage the redistribution of organisms to preserve biological diversity and maximise the provision of ecological goods and services, however defined. In particular, the final chapter addresses the needs and challenges for the development and integration of scientific knowledge of the water requirements of biota for policy, management plans and actions. It also provides some thought-provoking discussion on maximising the use of environmental water and on improving understanding of overall system resilience.

Understanding the water requirements of freshwater biota in inland floodplain wetlands is critical for the survival, regeneration, maintenance and management of these ecosystems and their ecological communities. *Floodplain Wetland Biota and the Murray-Darling Basin* is a timely addition to the body of knowledge linking hydrology and ecology in the dynamic and complex system of the Basin, and is a 'must read' for anyone working on and interested in how the Basin 'works'. It is one of the first truly eco-hydrological efforts to focus on a range of obvious and not-so-obvious taxa. It is an authoritative, comprehensive and essential reference for Basin managers, policy makers and researchers, and an enjoyable read to boot! Net profits from the book will go towards wetland research.

Dr Gina Newton, Department of Sustainability, Environment, Water, Population and Communities, Canberra.

Information Resources and Useful Websites

Profiles of threatened plants and ecological communities

www.anbg.gov.au/anpc/

If you are seeking information on plant species and ecological communities listed under national, state and territory laws in Australia, links to relevant web sites are available on the ANPC website. The type of information provided on each government site varies from fact sheets to profiles to recovery plans or action plans. Information provided for each species or ecological community generally includes one or more of the following: listing status, description, habitat, distribution map, illustrations, threats and recovery actions.

Search tool for nationally threatened species and ecological communities by Natural Resource Management region

www.environment.gov.au/cgi-bin/sprat/public/conservationadvice.pl

This web site allows users to identify, for each Natural Resource Management (NRM) region in Australia, those nationally listed species and ecological communities located within the region. By just ticking the box for a selected NRM region, a report is generated that shows every species and ecological community listed under the EPBC Act that might be located in the region. For each species and community, hot links are provided to a profile of the species/community (that includes its status), to the conservation advice for it, and to its recovery plan (if one exists).

Australian Lichen Website

www.anbg.gov.au/lichen/

This new web site contains a wealth of information about Australian lichens. The site provides an introduction to this group of organisms in a way that non-experts can easily grasp, and assumes no prior lichen knowledge. It includes sections on What is a lichen?; Form and structure; Lichen chemistry; Ecology; Reproduction & dispersal; Classification; Lichen biogeography; History of Australian lichenology; and Lichens and People. Special pages are provided for *Xanthoparmelia*, a well studied genus that is widespread in Australia and has the most species of any lichen genus found there, and Basidiolichens, a more unusual group of lichens. The website will not help readers to identify lichen taxa, but provides references to various printed and electronic sources available for that purpose. It also has an annotated bibliography to help people search for other sources that are useful for identifying lichens in Australia.

Conservation value of Travelling Stock Reserves

NSW Department of Environment, Climate Change and Water

In 2009–10 the NSW Department of Environment, Climate Change and Water undertook a project to collate the known biodiversity survey data for travelling stock reserves and travelling stock routes (TSRs) across the slopes and tablelands of New South Wales. Datasets for around 2700 of the 5000 TSRs in the region indicated that about 65% are likely to support at least one nationally- and state-listed endangered ecological community. At least 20% of the TSRs have high conservation value and a further 75% are rated as having important conservation value. The data have been compiled in spreadsheets and constructed as a shapefile that can be used in a geographic information system to produce maps of TSRs. The spreadsheets and shapefile can be accessed at www.gbwcmn.net.au/node/6; ArcMap software (or other similar software that will read ESRI shape files) is required to view the latter. The shapefile will be updated periodically as new information becomes available.

Soft Engineering solutions for swamp remediation—a 'how to' guide

Save our Swamps

This guide is an online manual with step by step instruction in the design and installation of soft engineering swamp remediation and rehydration structures. All have been tested in the Temperate Highland Peat Swamps on Sandstone Endangered Ecological Communities in the Blue Mountains, Lithgow, Wingecarribee and Gosford Local Government areas. Covering materials, design, construction and whole-of-catchment strategies to achieve sustainable outcomes, the techniques described in the manual have potential applications in a range of analogous swamp systems. The guide can be downloaded free from http://saveourswamps.com.au/Swamp-Remediation-Manual.php.

Australian Tropical Rainforest Plants, Edition 6—online interactive key

www.anbg.gov.au/cpbr/cd-keys/rfk/index.html

This is an interactive identification and information online system for 2553 species of plants (trees, shrubs, vines, palms, pandans, herbs, grasses and mistletoes) of northern Australian rainforests, and includes species from Broome in Western Australia to Townsville in Queensland. The tool provides an easy to use and simple means of naming a rainforest plant using whatever information is available, by selecting characters from the plant (or specimen), and responding to a series of choices that result in identification via a process of elimination. Characters that can be selected

Information Resources and Useful Websites (cont.)

cover morphology (habit, bark, leaves, flowers, fruits, buds and seedlings) and some geographic and ecological information. Interpretation of the character information is assisted with help notes and images featuring colour or line drawings. Information for each species includes common name, the formal scientific name and nomenclatural synonyms, geographic and ecological information, distinguishing features and natural history notes.

101 plants of the Wet Tropics: a field guide

Martin Cohen and Julia Cooper
Wild About the Tropics, Cairns, 2010
Full colour, soft cover; $10 plus postage and packaging

This guide features a selection of plants that are most likely to be observed during a visit to the Wet Tropics and includes several iconic species. The field guide is packed with essential identification information and photographs, and is available from <http://www.wildtropics.com.au/BooksForSale.htm>.

Native trees of the NSW South Coast: Berry, Kangaroo Valley, Nowra, Ulladulla, Batemans Bay

Kevin Mills and Jacqueline Jakeman
Envirobook, Canterbury, NSW, 2010, 256 pages
Paperback, ISBN 9780858812307, AU $34.95

This book on the native trees of the New South Wales South Coast is the culmination of 25 years work by the authors. It provides a guide to the native trees of the South Coast region, from Berry in the north to Batemans Bay in the south, and west to Kangaroo Valley, Sassafras and Nelligen. A total of 169 tree species is described and richly illustrated with line drawings and colour photographs. The book is likely to be of interest to botanists, horticulturalists, gardeners and nursery workers, and is available from www.envirobook.com.au/.

What south east native plant is that? Identifying and growing native vegetation in the south east of South Australia

Neville Bonney
South East Natural Resources Management Board, c. 2010, AU $45

This is a revised and significantly updated version of *What South East Native Plant is that?* originally printed in 1977. The book is a guide for those wanting to identify the native plants of the South East Region, and contains hundreds of colour photos and many black and white line drawings of plants. Easy to read, the book offers a deeper insight into the flora, with plant descriptions supported by historical, economic and Aboriginal information, and areas where plants can be found. It is likely to be useful for primary and tertiary students, volunteers, landholders, managers of native vegetation, seed collectors, revegetators and native plant enthusiasts, and will help people to understand the important plant species of the region and their conservation and heritage value. Copies of the book can be purchased from the South East NRM Board, PO Box 30, Mount Gambier, SA 5290. A purchase order form can be downloaded from <www.senrm.sa.gov.au/PublicationsResources/WhatSouthEastnativeplantisthat.aspx>.

Conferences and Workshops

4th Biodiversity Across the Borders Conference Vulnerability and Resilience of Ecosystems

9 June 2011
Mt Helen campus, University of Ballarat, Vic

The conference will be conducted by the University of Ballarat, La Trobe University, Deakin University, Victorian University, Charles Sturt University, Melbourne University, and RMIT. The aim of the conference is to 'show case' the ecological work of these universities in regional Victoria and New South Wales, both to other ecologists and to management agencies. There will be no registration fee.

Further information: contact Singarayer Florentine s.florentine@ballarat.edu.au.

Nature Conservation Council of NSW Bushfire Conference 2011 – Bushfire in the Landscape: Different Values, a Shared Vision

23–24 June 2011
Surry Hills, Sydney

This is the Nature Conservation Council of NSW Bushfire Program's Eighth Biennial Bushfire Conference. It will explore how differing values and land uses influence the application of fire in the Australian landscape, and investigate the impacts this has had on biodiversity. The conference will present new scientific research, policy updates and on ground management issues and success stories. The conference themes are Biodiversity; Risk management; Production and water security; and Indigenous connection.

Further information: www.nccnsw.org.au/content/bushfire-landscape-different-values-shared-vision

Conferences and Workshops (cont.)

Fungimap & the Western Australian Naturalists Club
Fungimap VI Conference

14–19 July 2011
Denmark, Western Australia

Fungimap VI will consist of a day of fungal talks on 15 July followed by three days of forays and workshops. Forays will include a day trip to the Valley of the Giants to see the giant red tingle trees. The Conference includes a celebratory fungal dinner and a fungal trivia night. There will also be exhibitions of fungal photography and fungal art displayed around the town.

Further information: http://www.rbg.vic.gov.au/fungimap/fungimap-vi-conference

16th NSW Weeds Conference
Making a Difference—from coast to coast

18–21 July 2011
Coffs Harbour, NSW

The conference will provide an opportunity to meet with other contemporary weed professionals, share knowledge and learn about innovative weed management through a fresh range of learning experiences. It will include sessions on strategic planning; reforming weed management; on-ground programs; weed threats to biodiversity; strategic approaches to weed management; weed management technologies; and weed partnerships.

Further information: http://2011weeds.coffsharbour.nsw.gov.au/

XVIII International Botanical Congress

23–30 July 2011
Melbourne, Vic.

Congress themes include Systematics, evolution, biogeography and biodiversity informatics; Ecology, environmental change and conservation; Structure, development and cellular biology; Genetics, genomics and bio-informatics; Physiology and biochemistry; and Economic botany including biotechnology, agriculture and plant breeding. Keynote symposia under consideration include topics such as Climate change and adaptation; Evolutionary biology of land plants; Food production: challenges and solutions; Origins of Australian and southern flora; Plant biotic interactions (including plant–insect–fungi); Plant diversity and ecology; and Plant systematics in the 21st Century.

Further information: www.ibc2011.com/Program.htm

23rd Asian-Pacific Weed Science Society Conference
Weed Management in a Changing World

25–30 September 2011
Cairns, North Queensland

The conference returns to Australia for the third time in 2011, supported by the Weed Society of Queensland (WSQ), the Council of Australian Weed Societies (CAWS) and the Asian-Pacific Weed Science Society (APWS). There will be presentations on the role of genetically modified organisms in weed management, climate change, water availability, biosecurity, population growth and the utilisation of weeds.

Further information: www.apwss2011.com

Australian Native Plants Society 2011 National Biennial Conference
Australian Plants in a Wondrous Web

2–7 October 2011
Marion, South Australia

The conference will include informative and entertaining presentations from a variety of speakers, as well as practical workshops. Attendees will also have a choice of pre-conference tours to Kangaroo Island and the Flinders Ranges, and post-conference tours to Kangaroo Island and to the Coorong and South-East.

Further information: www.australianplantssa.asn.au/conference_2011.html

2011 Annual Conference of the Ecological Society of Australia
Ecology in Changing Landscapes

21–25 November 2011
Hobart, Tasmania

The theme of the conference encompasses all natural systems, from terrestrial to freshwater and marine, and from the molecular to the ecosystem level. The aim of the conference is to inspire challenging dialogue across all fields of ecology and to link ecological research with practical conservation biology. Symposia will address areas such as Ecology of extreme environments; Thresholds and resilience—retaining, restoring and recreating ecosystems in changing landscapes; Politicising ecology—linking ecology, policy, planning and politics; Integrating patterns, processes and scale in changing landscapes; Species extinction and range changes; Ecosystem services; Genes to ecosystems; Pests and diseases; Island ecology; Reserve challenges—the role of private property conservation.

Further information: http://esa2011.org.au

ANPC Workshops

The Translocation of Threatened Plants

26 & 27 May 2011

Department of Sustainability & Environment, Melbourne

Have you been involved in, or would you like to be involved in, the planning, approval or implementation of a translocation project for threatened flora? Then this workshop is relevant to you!

The workshop will include case studies of translocation programs, highlighting lessons to be learnt. This workshop also includes a half-day field trip to translocation recipient sites for *Diuris fragrantissima*, *Pimelea spinescens* and the Striped Legless Lizard.

Workshop fees (includes catering, a copy of the translocation guidelines and GST but does not include accommodation or transport): ANPC member $150, Concession (ANPC member) $130 Non-member $165, Concession non-member $145.

Registration forms are available from the ANPC: web: www.anpc.asn.au, ph: 02 6250 9509 or email: anpc@anpc.asn.au

Registrations close: COB Tuesday 17 May 2011.

ANPC Corporate Members

ANPC gratefully acknowledges the support of the following corporate members

Albury Botanic Gardens, NSW

Approvals and Wildlife Division, Department of Sustainability, Environment, Water, Population and Communities

Australian National Botanic Gardens, ACT

Botanic Gardens of Adelaide, SA

Botanic Gardens Trust, NSW

Centre for Plant Biodiversity Research

Department of Environment and Conservation, WA

Dept of Sustainability and Environment, VIC

ForestrySA

Greening Australia, VIC

Mackay Regional Botanic Gardens, QLD

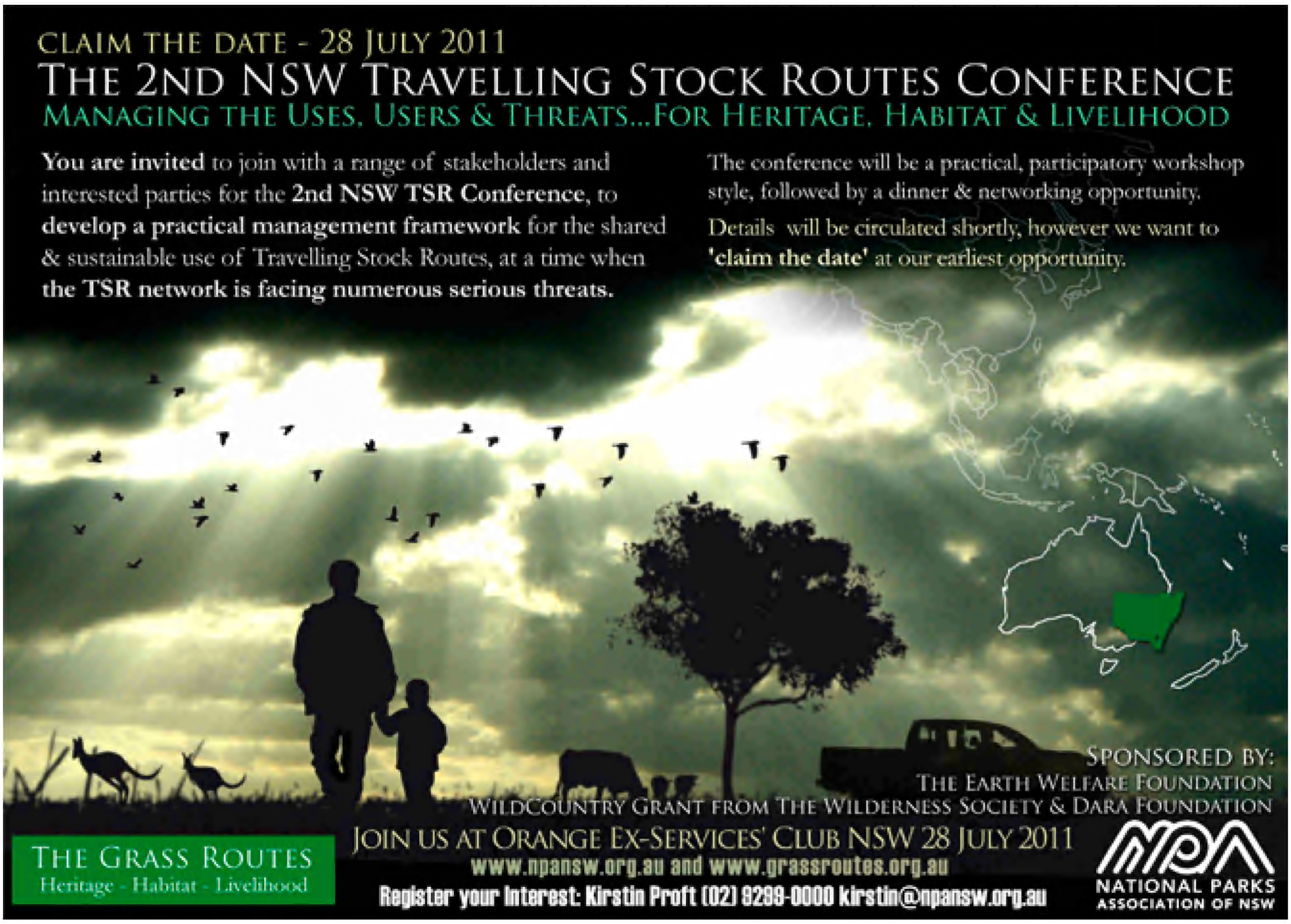
Redland City Council, QLD

Royal Botanic Gardens Melbourne, VIC

Royal Tasmanian Botanical Gardens, TAS

Sydney Olympic Park Authority, NSW

University of Melbourne, Burnley Campus, VIC


CLAIM THE DATE - 28 JULY 2011

THE 2ND NSW TRAVELLING STOCK ROUTES CONFERENCE

MANAGING THE USES, USERS & THREATS...FOR HERITAGE, HABITAT & LIVELIHOOD

You are invited to join with a range of stakeholders and interested parties for the **2nd NSW TSR Conference**, to **develop a practical management framework** for the shared & sustainable use of Travelling Stock Routes, at a time when **the TSR network is facing numerous serious threats.**

The conference will be a practical, participatory workshop style, followed by a dinner & networking opportunity.

Details will be circulated shortly, however we want to **'claim the date'** at our earliest opportunity.

SPONSORED BY:
THE EARTH WELFARE FOUNDATION
WILDCOUNTRY GRANT FROM THE WILDERNESS SOCIETY & DARA FOUNDATION

JOIN US AT ORANGE EX-SERVICES' CLUB NSW 28 JULY 2011
www.npansw.org.au and www.grassroutes.org.au
Register your interest: Kirstin Proft (02) 9299-0000 kirstin@npansw.org.au
THE GRASS ROUTES
Heritage - Habitat - Livelihood
NATIONAL PARKS ASSOCIATION OF NSW

AUSTRALIAN NETWORK FOR PLANT CONSERVATION
presents a workshop on

Managing Native Vegetation in Travelling Stock Reserves

Are you working in or managing remnant vegetation? Would you like to know more about biodiversity conservation? Would you like to enhance your knowledge and skills? Then this workshop is for you! While it will focus on TSRs, the content is relevant for anyone managing grassy woodland vegetation remnants.

11 & 12 May 2011

Wagga Wagga | Kyeamba TSR and Tarcutta

26 & 27 May 2011

Bathurst | Local Bathurst TSR

Topics to be covered include:

DAY ONE

- Background of TSRs and current status
- Connectivity conservation in the landscape
- Biodiversity values of TSRs
- Case studies
- Everyone has a stake in TSR conservation
- Collaborative programs and approaches
- Where to get help (interactive session on available information)

DAY TWO

- Morning bird walk
- Identifying natural values (e.g. habitat, vegetation, fauna)
- Identifying threats to your site (e.g. weeds, erosion and over-grazing)
- Management actions workshop session
- How do you measure your success? (monitoring and targets)
- Discussion with panel of experts

WORKSHOP FEES

ANPC Member	$230
Concession (ANPC member)	$200
Non-member	$250
Concession (non-member)	$220

Fees include catering, copy of 'Plant Conservation Approaches and Techniques from an Australian Perspective', workshop notes and GST.

Registration forms and the full programme are available from the ANPC

Web: www.anpc.asn.au
Ph: 02 6250 9509
Fax: 02 6250 9528
Email: anpc@anpc.asn.au

Photos: Mates Gully TSR (Jackie Miles); Barking owl (Albury Botanic Garden); Steeple Flat TSR (Jackie Miles); *Discaria pubescens* (Jackie Miles)

Thank you to our project partners: Livestock Health and Pest Authority, Friends of Grasslands, Murrumbidgee CMA and Grassy Box Woodlands CMN. We would also like to acknowledge support from: Department of Environment, Climate Change & Water, Consultants, Greening Australia and the Department of Industry & Investment.